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NOTICES:—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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German Oil Processes

THE interesting article which a CHEMICAL AGE representative who has recently been staying in Germany contributes to this issue respecting the present state of the various oil processes helps to remove the confusion caused by recent contradictory reports from Berlin. The confusion was partly due to the assumption that the work of Bergius, Fischer and the Badische Co. was all part of one combined scheme. When one day it was reported that the coal liquefaction process was entering on the commercial stage, with substantial State credits behind it, and the next it was reported that the process was still in the experimental stage and any statement as to its commercialisation was premature, it was difficult to see the meaning of this daily see-saw. The situation, however, is now fairly clear.

The earlier of the recent reports, announcing that the Bergius process was to be put in operation related to the work of Dr. Bergius alone. A business man as well as a chemist, he has been seeking means of turning his own researches to practical account, and appears to have succeeded in obtaining the necessary financial support. It is, therefore, correct to say that the Bergius process is entering on the commercial stage, but that its commercial success ssremains to be demonstrated, and commercial succe comes in the end to mean quantity production at a saleable price. When the Badische Co. later announced that the coal liquefaction process was not ready for commercialisation, they also were correct, for they were referring to their own process and not to Dr. Bergius's. While no exact particulars are available at present, it is fairly common knowledge that the Badische Co. have been at work on this subject for some years; when they are ready for large scale production something more may be heard, but probably not before.

As regards synthetic methanol, however, the commercial success of the Badische process is, as we indicated, beyond any doubt. The product is already in the market at a price which threatens the extinction of one large industry in America. In addition, the company have, our representative ascertained, just patented a process for the employment of iron carbonyl, $Fe(CO)_5$, as a substitute for lead tetraethyl in the production of an "anti-knock" motor fuel, the aim, of course, being to secure this special advantage without the associated risk of poisoning. As regards the Fischer process for "synthol," Professor Fischer, like Dr. Bergius, is working quite independently of the Badische Co., but here again the last-named is investigating similar problems.

The general effect of the inquiries instituted, though it adds little to our knowledge of the technique of the various processes, is to disclose the relations of the parties responsible for them. The names Bergius, Badische and Fischer represent quite separate and independent investigations in the same or closely related fields, and the assumption that the great Ludwigshafen organisation was behind all these investigations proves to be unfounded. The Badische Co. are working on their own lines, independently of the other two researchers.

The Superphosphate Industry

THE members of the British superphosphate industry will find, in an article that a well-informed technical authority contributes to this issue, criticisms of a very direct kind of their existing methods, together with constructive suggestions for improvement. While recognising that in the case of young industries capable of becoming of national importance, the Safeguarding of Industries Act may be profitably taken advantage of, our correspondent offers a warning against the tendency to seek its aid too eagerly, and especially where an application is made, of making it upon incomplete or ill-considered grounds. The essential

point to be kept in view in such matters is that in the long run industries must live on their own merits and cannot reasonably expect to survive against more efficient competitors. Where the home producer is exposed to some special hardship or economic handicap, the provision of temporary help may well be considered, but to look to this as the remedy is to miss the fundamental point in the problem and to see only what is incidental.

Our correspondent, at any rate, makes no such mistake. If his estimate of the British superphosphate industry is even approximately accurate, a thorough reorganisation of methods seems essential if it is to hold its ground against foreign competitors. In many cases the existing works are not favourably situated and do not receive their raw materials direct from the port of origin. Even where the geographical situation is favourable, the arrangements for discharging steamers and conveying materials are described as "out of date, inefficient, and expensive to operate." It is surprising to learn that skips are used so largely in place of mechanical grabs. The suggestion is made that in some cases manufacture should be discontinued and production concentrated at the best situated and more efficient works, and generally that mass production, combined with modern methods and appliances, and regard to such matters as works costing, continuous operation and cheap transit charges can alone save the industry.

It may not be flattering to be told all this, but it is better to have to face unpleasant facts than to pay the inevitable penalty of ignoring them. If the fertiliser works amalgamate with a view to concentrating and increasing their productive capacity, if they modernise their methods of handling both raw materials and finished products, if they improve their manufacturing processes and take steps to secure a general reduction of railway rates, they will have gone far, in our correspondent's opinion, not only to disarm foreign competition, but to ensure increasing quantities of superphosphate being used in this country. There is point in his final reminder that demand is stimulated not by raising the prices of products, but by cheapening production and so being able to sell more cheaply to an increased body of consumers. It is reasonable to expect the reverse of this where reliance is placed on higher prices due to the artificial restriction of competition.

Liquid Fuel Resources

FOR a little time we have had some respite from the scaremongers' periodical warnings that a serious shortage of petroleum products must inevitably occur in a few years' time, and that it will be impossible to produce substitutes at prices in any way commensurate with those which now prevail. Interest recently has rather veered round to the effect on the market in general of substitutes produced by various systems of hydrogenation, and as regards the output of which there would appear to be no limit once the technical and commercial aspects of such processes are definitely mastered. As regards natural liquid fuels, however, it is interesting to recall an opinion expressed by the late Sir George Beilby, that while enormous stores of coal, sufficient to supply the world's needs for hundreds, if not thousands, of years were definitely known to exist, no such certainty as to the future of natural oil could be counted upon even for tens of years. Thus, we are left with nothing more reassuring as to future supplies than our confidence in the principle of continuity in Nature, which encourages the assumption that the experiences of the past fifty or sixty years in the opening-up of new oilfields as the old ones become depleted will be repeated for generations to come, and possibly on an increasing scale.

This, of course, is taking a long view of the situation. As regards the less remote future, some satisfaction is to be derived from an exceedingly interesting report on the petroleum resources of the United States which has just been issued by the American Petroleum Institute. Primarily, we are assured that there is no imminent danger of the exhaustion of the petroleum reserves of America, but that there is every reason to assume that sufficient oil will be available over a period which will reach well beyond the time when science will have limited the demand for natural oil by the development of oil substitutes. The latest estimate of the reserves of oil in America reaches such a staggering figure that its publication may tend to produce a feeling of apathy in connection with the introduction of improved processes. The report, moreover, contains no lack of suggestions as regards means for husbanding and extending existing resources. Among such suggestions the deep drilling of oil sands below those now yielding supplies is mentioned as being a possible means of disclosing oil in new areas, while a great deal is looked for from an extension and improvement of the system of "cracking," whereby the supply of petrol will be augmented and the output of fuel oil proportionally reduced so that it will ultimately be removed from direct competition with coal. Truly, it would seem that in the realm of liquid fuels everything points in favour of the consumer, and on no possible grounds can one foreshadow either an increase in cost or a shortage of supply.

Shoddy as a Fertiliser

ATTENTION was recently directed to the part that chemistry is playing in an increasing degree in the textile industry. Few would connect the latter with agriculture, yet the relationship is unmistakable after a perusal of the quarterly report of the Official Agricultural Analyst for Kent. The Report deals at length with shoddies, 185 samples of which were submitted for analysis, including 119 sold at "unit value." The sale and purchase of shoddy on the basis of a unit value is regarded as the most equitable method; indeed, a number of farmers will only buy on this basis. The practice in the past appears to have been a commendable one and might with advantage be continued under the new Fertiliser and Feeding Stuffs Act, which is now in course of preparation. The approximate grade is specified by the farmer, but the actual invoice is not rendered by the merchant pending the receipt of the analysis of a sample drawn by the official sampler. This procedure has hitherto operated for the most part to the mutual satisfaction of the buyer and seller, and its continuance can rightly be urged.

Of 63 *sampled* consignments of shoddy, sold with a guaranteed content of ammonia, 24 were found to be over-guaranteed. Some samples contained a considerable number of good wool wastes, analysing between 14 and 16 per cent. of ammonia. On the other hand, several shoddy consignments contained excessive quantities of water; indeed, as high as 60 per cent. No fewer than 19 samples contained upwards of 30 per cent. of water. Samples were examined that contained excessive amounts of mineral matter, consisting, in many cases, of the soil material obtained from fleece washings. If chemists were employed by the firms collecting, preparing and dealing in shoddy for manurial purposes, the conditions described by the analyst could hardly pass without detection. It may be added that shoddy and woollen rags are used as nitrogenous manure for roots and other crops, and have been found peculiarly suitable for hops, for which they are largely employed.

The Economics of Synthetic Camphor

A READER who is interested in the marketing of camphor was recently discussing with us the situation as between the natural product and that made synthetically from turpentine oil. One has been hearing lately a good deal about the economics of synthetic camphor, and its ability to hold its own from the commercial point of view would seem to rest very largely upon the prevailing price of the natural product and also, of course, upon the price of turpentine. It has usually been found that only when the cost of the natural product has been abnormally high has synthetic camphor been able to compete with it, but a great opportunity lies in the fact that the price of camphor is several times the price of turpentine and should leave plently of latitude for a really economic synthetic process. It would be interesting to know exactly what proportion of the camphor now consumed is actually manufactured from the camphor laurel, but one fact that is certainly evident is that the development of chemical processes has once again stepped into the breach and partly deprived Japan of the monopoly which she held in this product up to the beginning of the present century. Even to-day the output from Japanese sources is upwards of six million lb. per annum, but the rapid growth that has taken place in the utilisation of celluloid has led to a corresponding demand for camphor, so that there is plenty of scope for the synthetic product.

It may be recalled that during the war, owing to the failure of supplies of the normal product in Germany, synthetic camphor was manufactured on a large scale, and although there is no precise information as to what these German plants are now doing, it is understood that in America it is claimed that the greater part of the requirements of the celluloid industry can be met by synthetic means. From the technical point of view it should be borne in mind that the only processes which have proved of value in commerce start from pinene, the main constituent of American oil of turpentine; and although theoretically 100 parts of pinene should yield 119 parts of camphor, in practice the yield is very much smaller. In studying the economics of the synthetic substance and the opportunities afforded for its production in greater quantities it should, however, not be forgotten that the by-products resulting from the process, all of which can be completely recovered, have the same value for the manufacture of paints and varnishes that turpentine has, while other have, their uses in the production of essential oils. Finally it may be noted that although the synthetic camphor of commerce is as a rule optically inactive, and it is, therefore, not strictly official from the pharmaceutical point of view, the present consensus of opinion is that when of good quality it is quite equivalent to the substance derived from the camphor laurel. Elsewhere in this issue an account is given of interesting developments in connection with synthetic camphor in France.

Points from Our News Pages

An explanation of recent conflicting reports on the present state of German oil processes, and further details with regard to the Bergius process are given as the result of special investigation by a CHEMICAL AGE representative (p. 268).

The important possibilities and properties of artificial resins are discussed in an article by Mr. A. C. Hopper (p. 270).

Strong criticism is offered of existing methods in the superphosphate industry, together with constructive suggestions for improvement (p. 272).

Dr. Alexander Findlay's address before the American Chemical Society on "The Twilight Zone of Matter" (I.) (p. 274).

Further papers read before the British Association: The Commercial Marketing of Peat, Economical Standardisation, and the discussion on Carbon Chains (p. 276).

Important commercial possibilities are claimed for a new "proofing" process (p. 280).

The London market has been quietly steady, but without feature. There has been fair export inquiry, but completed business is below the average (p. 286).

Heavy chemicals have been fairly active in the Scottish market, but prices generally are unchanged (p. 289).

Books Received

REPORT ON THE TRADE AND INDUSTRY OF PERSIA. April, 1925. By R. H. Hadow. London: H.M. Stationery Office. Pp. 50. 1s. 6d.

TECHNISCHE FORTSCHRITTSBERICHTE—MINERALÖLE. By Dr. Egon Eichwald. Dresden and Leipzig: Theodor Steinkopff. Pp. 152. 6 marks.

TECHNISCHE FORTSCHRITTSBERICHTE—INDUSTRIE DER FETTE UND SEIFEN. By Dr. O. Steiner. Dresden and Leipzig: Theodor Steinkopff. Pp. 84. 4 marks.

The Calendar

Sept 12	Mining Institute of Scotland: General Meeting.	Newbattle Colliery, Newtongrange.
12	Mond Nickel Co., Ltd., 25th Anniversary: Unveiling of a Bronze Statue of the late Dr. Ludwig Mond. 2.30 p.m.	Clydach Works, Swansea.
14	Institution of the Rubber Industry: "On Some Rubber Compounding Tendencies." W. B. Wiegand. 8 p.m.	Engineers' Club, Coventry Street, Piccadilly, London.
16 & 17	Ceramic Society: Refractory Materials Section Meeting.	Chemical Society's Rooms, Burlington House, Piccadilly, London.
Oct. 4	**Société de Chimie Industrielle: Fifth Annual Congress.**	**Paris.**
Oct. 23	**Engineers' Club: Annual Dinner.**	**Savoy Hotel, London.**

Latest German Developments in Coal Liquefaction

The Situation Investigated by "The Chemical Age"

A representative of THE CHEMICAL AGE *has just returned from a visit to Germany, during which he obtained some interesting information on the processes for coal liquefaction, which throws new light on the situation, so largely confused in the reports appearing in the newspapers recently.*

THE reports appearing in the Press recently regarding Germany's liquid fuel developments have given such varied, and in many cases contradictory, accounts of the present state of these processes, that it has up to now been impossible to conclude anything very definite from them. THE CHEMICAL AGE expressed the view, when the first announcements were received from Berlin that Germany had established the conversion of coal into oil as a commercial success, that the reports

WORKS OF THE BADISCHE ANILIN AND SODA CO., MENTIONED IN OUR ARTICLE, AT LUDWIGSHAFEN ON RHINE

were in all probability exaggerated, but the sources from which they were quoted, at least in several instances, allowed of no dogmatic contradiction.

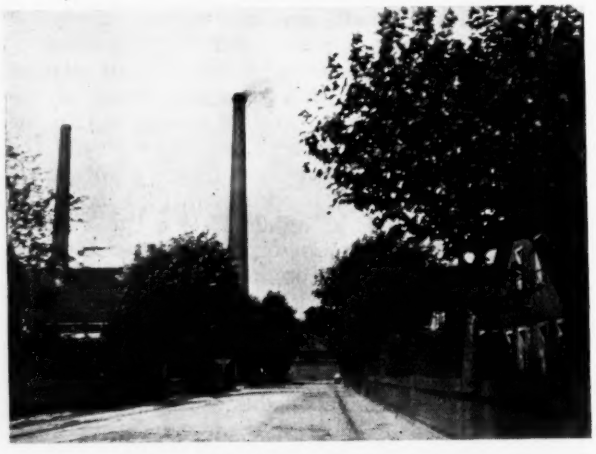
When I set out with the object of investigating the coal liquefaction problem in Germany, it was not without some doubts as to whether any reliable information would be afforded, having regard to the crucial state at which the matter, especially in its business aspect, appears to have arrived. However, some interesting facts were forthcoming and, contrary to expectation, it was possible to gain more exact information as to the German position, and thus to remove some of the misconceptions as to the various processes caused by the ambiguous and conflicting statements recently circulated from Berlin. It will be no surprise to those familiar with German methods to learn that within the various works investigating coal liquefaction the strictest secrecy at present prevails as to the actual stage at which the processes have arrived. I gather that no German patents of recent date have been issued and much caution is in consequence being exercised, but all my inquiries were answered with the greatest cordiality.

The Bergius Process

The process patented by Dr. Bergius for the liquefaction of coal is not the only one in the field. There are patents for synthetic methanol and other liquid fuels derived from coal based on methods quite independent of the Bergius process. It has rather generally been supposed that the Bergius process, together with the Fischer process for the synthesis of so-called "synthol," was under the control of the Badische Anilin and Soda Co., which in the past revolutionised two industries by its development of synthetic dyestuffs and its perfection of Haber's process for the fixation of atmospheric nitrogen. This, however, is not the case, and in fact the Bergius process was invented and developed independently and without any support by or connection with the Badische Co.; nor had this firm any control of the Fischer process, but they developed their own method for the synthesis of methanol. I gather that Dr. Bergius is an enterprising business man as well as a chemist who, having invented the one—admittedly revolutionising—process, has for some time past been engaged in commercialising it to the utmost of his ability. But his process is still regarded as in the experimental stage and, though he has been repeatedly reported to be engaged in selling foreign licences and exploiting the rights of the process generally, its commercial success still remains to be demonstrated. This fact may afford an explanation of the rival developments which are at present being investigated on the basis of his process, designed to establish it commercially. I was assured, in one case, that although opinion is distinctly favourable to final commercial efficiency of the Bergius process, nevertheless, as was concluded in a recent editorial note in THE CHEMICAL AGE, it by no means follows that its success is yet established. There was little doubt on the part of the expert in question that the process will eventually and perhaps shortly become an industrial proposition, but in his opinion it would be preposterous to take its success for granted. Dr. Bergius's own experiments at Rheinau have, I understand, not passed beyond the small scale, and nothing has become known of other more successful investigations on coal liquefaction. The silence which has followed the sudden outburst of news of a month ago and the atmosphere of secrecy with which the question is surrounded at present even in Germany would seem to bear out this statement.

State Subsidy Reports Denied

One naturally inquired how, if this were the case, the report from Berlin was to be explained, which stated that a German State grant or guarantee of 2,500,000 marks had been made towards the cost of erecting works at the Wenceslaus coal mines in Lower Silesia for the treatment of large quantities of coal by the Bergius process. I was amazed to find in quarters which might be assumed to be in the closest touch with the latest developments that absolutely nothing had been heard of this.



GARDEN SUBURB, ADJOINING THE BADISCHE FACTORIES, FOR THE 25,000 MEN EMPLOYED BY THE CONCERN

Not only was nothing known of this loan, but I was assured that not a penny of subsidy has been granted by the Government to chemical processes in Germany before or since the war and certainly not to the liquid coal or methanol developments. Even the statement so largely circulated in America that the German dyestuffs industry had been subsidised appears to have no foundation whatever.

The chemical industry was, of course, working largely for the needs of the Government during the war, but has since received no State aid. But, even allowing the subsidy report to be false, I asked from what source such apparently definite announcements had come, and who was responsible for them. It appears that the reports appearing in the London Press were almost as great a surprise to German ears as they were to ours, and caused nearly as much comment.

Confusion of Recent Reports

As already stated, I was informed that the Bergius and allied processes have not yet passed the experimental stage. How then did the exaggerated reports arise? One explanation offered was that the process for synthesising methanol has largely been confused with that for getting oil from coal, the two having attracted interest almost simultaneously. While direct coal liquefaction is still outside an industrial scale, synthetic methanol is already a commercial product and as the two are liquid fuels and both made by a synthetic transformation of coal they have inevitably been confused, especially in the popular reports, when, of course, they are entirely separate processes and products. Because thousands of gallons of synthetic methanol are being made at the present time, success has too readily been assumed for the other fuel process, and it is not improbable that some of the reports relating strictly to the one fuel may have been misapplied to the other.

As to the synthetic methanol situation, it appears that there are several proposals for the catalytic manufacture of this product, of which, however, only the Badische process is at present workable and established commercially. When inquiring about Dr. Fischer's process for synthol, I was told that, while Dr. Fischer is a director of the Kaiser Wilhelm Institute at Mülheim-Ruhr, the Badische Co. had a process of its own which also employs water-gas as the starting material. I understand that it is an extension of the company's process, originally patented in 1913, for the conversion of carbon monoxide to synthetic liquid products, which, however, then chiefly consisted of various hydrocarbons resembling petroleum; but the patents were phrased rather broadly and vast quantities of methanol are at present being synthesised from carbon monoxide and hydrogen. The importance of cheap power alcohol and other liquid fuels is recognised in Germany.

America and Synthetic Methanol

With regard to the export of synthetic methanol to America and its effect on the wood spirit industry, I could not get any definite information, as this is a commercial question. But it seems to be pretty generally accepted that even if the contemplated 50 per cent. increase in the import tariff is secured—and it appears the U.S. Government is hesitating over this step—German methanol firms will still be able to undersell the American wood spirit. This is in keeping with Mr. Brotherton-Ratcliffe's recent opinion, in his impressions of American industry which appeared recently in THE CHEMICAL AGE, that at present German spirit can be landed in the States at 47 cents the gallon duty paid, while the cost of manufacturing wood spirit is 80 cents.

Methanol, however, is not Germany's only synthetic fuel development. Dr. Fischer, who, like Dr. Bergius, is an independent chemist, notwithstanding recent reports of his connection with various firms, is continuing his work on his "synthol" fuel, a mixture of higher alcohols and ketones.

Possibilities of Synthol

Obtained by the catalytic reduction of carbon monoxide under high pressure, this fuel is likely to become of commercial importance as has been evidenced by some experiments carried out on it, which are described in detail in Dr. Fischer's latest book, *The Conversion of Coal into Oils* (Ernest Benn, Ltd.), translated by Dr. R. Lessing. Some road trials were made in order to test the suitability of "synthol" as a motor fuel, and for this purpose the crude oil, separated from its aqueous liquor, was freed of acid and distilled in a fractionating flask up to 200°, when 87 per cent. of distillate was obtained. This shows, therefore, that the bulk of this oil is available as a light motor spirit, and in addition its flash point is very low. The running tests were made on a level road and, to restrict the amount of fuel required, a 4 h.p. motor cycle was used with a load of two persons, the speed being kept constant at about 20 m.p.h. The results of these tests showed that, although synthol has a lower calorific value than benzol, it gives more power, while a mixture with benzol was still more efficient. The engine started readily with synthol alone and ran very smoothly, as also with the benzol mixture. The trials, it is stated, were made merely to give an indication whether synthol is suitable as a motor fuel, but the mileage obtained showed that it is equal to benzol and perhaps even superior, because of such properties as its ability to bind water.

Although, as far as I could gather, the synthol process does not yet play any rôle whatever as a business proposition, it is an example of the acute interest that research in synthetic fuels is attracting in Germany at present. It is claimed by Dr. Fischer that the process is especially favourable to industrial application, because it appears that the construction of the apparatus for its working is less difficult than that required, for instance, for the synthetic ammonia process, since the carbon deposition is said to have been successfully suppressed and the pressures are not so high. It is, of course, common knowledge that not only coal but any solid fuel is utilisable for the production of water gas, such as peat, wood and their carbonising residues, and this fact will give especial advantage to the synthol process, if it becomes a commercial success, as it could be carried on wherever cheap power is obtained, some kind of suitable fuel being available almost everywhere.

A New Petroleum Compound

Reference has lately been made in THE CHEMICAL AGE to a new product which can be added to petrol in small quantities, and I was able to obtain some further details of this substance. The Badische Co. has recently patented a process for the employment of iron carbonyl, $Fe(CO)_5$, as a substitute for lead tetraethyl for addition to motor fuels, especially petrol, to produce an "anti-knock" effect, but unlike the lead compound it leaves no poisonous combustion gases. I understand that large scale investigations with petrol mixtures are still necessary with the object of studying exactly the properties of the new petrol embracing the non-poisonous iron compound, before this fuel will be marketed. It will have the same advantages of additional power, and none of the disadvantages of lead ethyl petrol—the "ethyl gas" now being sold in America.

If the general welfare of the prople may be taken as an indication of the state of trade, my impression is that German industry is recovering once more, notwithstanding the war and its succeeding currency chaos. In spite of the reparations to be paid, the taxation per head in Germany is lower than that in this country, a fact which is probably connected with the steady production which is characteristic of German industry. The chemical trade appears to be improving, if the recent German Dye Cartel reports are evidence of its condition, most of the companies paying an 8 per cent. dividend, and I gather that some of the larger concerns are employing greater numbers of men.

Anglo-German Trade Treaty

THE Foreign Office announces that ratifications of the Commercial Treaty between Great Britain and Germany were exchanged on Tuesday. The text is a document comprising thirty-three articles and a protocol of eight clauses.

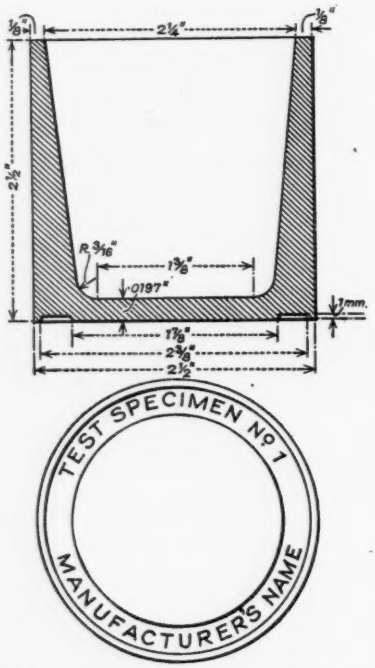
The Treaty not only includes all concessions ever obtained under most-favoured-nation clauses, but also particularises in a way that has never previously been the case. One clause of the Protocol opens the German market to British insurance companies and British banks, another provides for the emigrant and trans-emigrant trade, and another involves the acceptance of the Barcelona and Geneva Conventions, which would be replaced by one of the articles if they should ever be repudiated. The Geneva Convention, which recognises the principle of arbitration in commercial agreements, is regarded by Chambers of Commerce as one of the most important trade agreements existing. Certain of the articles lay stress on the intention of the contracting parties to grant reciprocal freedom of commerce and navigation, and one sets out a number of grounds to which the contracting parties agree to limit their right to impose prohibition or restriction on imports and exports.

Artificial Resins and Plastic Substances

By A. C. Hopper

The utilisation of natural resins is hampered by the fact that their quantity is limited, while their quality varies considerably. It has accordingly been one of the aims of the chemist to prepare equivalent substances by chemical means—a science which has made such progress that there is the possibility of the natural product being entirely displaced by artificial resins within the next few years.

CONSIDERING how wide a field of useful applications has been found during the past decade for artificially prepared resins and plastic substances, surprisingly little space has been devoted to the subject. Quite apart from their value as electrical insulators, they have been employed for the manufacture of gramophone records, motor car windscreens, steering handles and distributors, knobs, buttons, cigarette holders, pipe mouth-pieces, brush handles, combs, fountain pens, and many other moulded articles. In one instance, at least, a transparent substance, clear as rock crystal, of



SKETCH OF AMERICAN TESTING CUP.

high refractive index, and more permeable to ultra-violet radiation than ordinary glass, has been obtained. This "organic glass" possesses the additional advantage of being readily turned on a lathe.

The starting materials from which these substances may be prepared are extremely varied, but the present article will be devoted almost exclusively to those derived from :—(1) Phenols and formaldehyde (of which a typical representative is bakelite) ; (2) Urea and formaldehyde (of which Pollopas will be taken as an example).

Broadly speaking, these resins may be divided into two classes, namely :—(i) Fusible resins, somewhat analogous to the natural resins, and termed by Bækeland "Novolaks" (*Ind. and Eng. Chem.*, Vol. 2, 932), and (ii) Resins, which after final heating become infusible and insoluble, which are sometimes spoken of as "potentially reactive resins," or, following Bækeland, "Resinoids" (*Ind. and Eng. Chem.*, Vol. 17, p. 225).

The latter are by far the most important, and pass through three stages in course of preparation, viz. :—(*a*) A fusible, soluble stage ; (*b*) A fusible, insoluble stage ; (*c*) An infusible, insoluble stage.

Before proceeding to a discussion of the chemistry of these, it may be well to inquire what properties are desirable in a resin for use as a plastic in moulding, with or without a "filler." The following are among the most important points :—(1) The substance must take a sharp impression of the mould ; (2) It must not stick to the mould, or the surfaces of both mould and object will be impaired ; (3) It must not decompose under heat and pressure, or "spotting" of the mould and the work will result ; (4) For hot moulding the change from stage *b* to stage *c* must be rapid, otherwise the output will be low, or the cost of moulds excessive ; (5) For cold moulding no appreciable deformation or shrinkage must occur in the subsequent baking operation, which is required to effect the transition from *b* to *c* ; (6) It should yield a lustrous highly finished surface free from "flow-marks" and "undulations" ; (7) For practical commercial use the changes from *a* to *b* and *b* to *c* should not take place spontaneously ; (8) It should "flow" readily in the mould, as otherwise its insulating properties will be impaired (see section on Testing) ; (9) It should not be hygroscopic, as a condensed film of moisture lowers its insulating properties ; (10) It should be non-inflammable, and not readily softened by heat after it has passed into stage *c*.

When to the above list of desirable properties is added the fact that it must also be produced cheaply in order to compete with the natural resins or else possess some very outstanding property which these do not share, it is hardly to be wondered that even as recently as fifteen years ago, resinous substances were regarded (by students at all events) with some disdain, and looked upon as a fitting punishment for faulty manipulation.

Reaction between Aldehydes and Phenols

The reaction between aldehydes and phenols has long been known, but the exact conditions under which it can be brought about in a commercially serviceable manner were little known prior to 1909, and the following description will give some idea of the difficulties encountered and the devices employed for overcoming these.

No reaction takes place in the cold between aldehydes and phenols in the absence of a "condensation agent." In the presence of an acid reagent, the combination is violent and erratic, and yields a porous mass not readily amenable to subsequent treatment (*Ind. and Eng. Chem.*, Vol. 1, page 149, etc.). With an alkaline reagent Bækeland found (U.S. Patent 942,809) that in the presence of alkali equivalent to one-fifth of the amount needed to convert the phenol into phenolate, the reaction proceeded satisfactorily, but somewhat slowly. In a subsequent patent (U.S.P. 1,187,229) he claims that the initial process may be shortened by the use of a much greater quantity of alkali, and then neutralising the excess with an acid (hydrochloric or sulphuric, for example), and removing the salt so formed by separating the reaction mixture into layers (U.S. Patent 942,852) before proceeding to stage *b*. The last cited patent also gives an alternative method of using a salt of a heavy metal to remove the excess alkali, the precipitated oxide of the heavy metal remaining intimately incorporated in the mass and serving as a filler.

At a still later date (*Ind. and Eng. Chem.*, Vol. 2, p. 932) he discoverd that stage *a* may be effected in two parts, viz., obtaining a Novolak, or fusible soluble resin, by acting on more than 15 molecules of phenol to every 14 of formaldehyde, with an acid reagent, and subsequently treating the Novolak so produced by melting it and mixing it with polymers of formaldehyde, thus completing stage *a*. After separating the resinous layer as completely as possible from the aqueous layer, the transition from *a* to *b* is effected by heating the resinous layer to 70° C. in an inert gas under pressure until it sets to a rubber-like mass (U.S. Patent 942,700). The final stage from *b* to *c* is accomplished by heating under a pressure of 50–100 lb. per sq. in. at a temperature of 160° C. This pressure is required to counter-balance the dissociation pressure of the substance at 160° C. through splitting off of formaldehyde groups, which leads to the formation of a porous mass (U.S. Patent 942,699 and *Ind. Eng. Chem.*, 1, 149, *et seq.*).

Pollak (U.S. Patent 1,369,352) asserts that *colourless* phenol-formaldehyde condensation products would be obtained if phenols could be made to combine with formaldehyde in the cold and in the absence of a condensing agent, and that these products would be unaffected by light and air. He claims that practically colourless condensation products can be obtained if only 0·2 parts by weight of sodium phenolate be used to each 100 parts crystallised carbolic acid and 80 parts by weight of 40 per cent. formaldehyde, the whole being heated under a reflux condenser until the condensation product is precipitated. To prevent subsequent colouration through oxidation of the "leuco" products by light and air, these, and the excess of carbolic acid, must be removed. Most of them are eliminated by shaking with a *large* excess of water so that the phenol solution so obtained is too dilute to dissolve the resinous matter; the remainder may be got rid of by using a mixture of methyl alcohol 10 parts to 100 parts of water, or they may be destroyed by neutral 3 per cent. hydrogen peroxide. The final product so obtained may be used for wind-screens for motor cars in spite of a faint yellowish tinge.

Effect of Alkalis on Colour

It is rather interesting to note that, according to Bækeland (U.S. Patent 1,187,230), different alkalis impart different colours to the final product; thus, ammonia gives a yellow colour, whilst potash imparts a purplish tinge. This statement suggests the idea that by a suitable blending of alkalis for use as a condensation agent, a colourless product might be obtained even under normal working conditions, thus eliminating the additional operations laid down in this patent as essential for the removal of substances which under the action of light and air would become coloured.

The use of furfural or benzaldehyde to the extent of 30 to 50 per cent. of the resin used, is recommended by the Redmanol Products Co. (Br. Pat. 230,619) as being beneficial for the cold-moulding of phenol-formaldehyde condensation products. It is claimed that these impart to the mass a lustrous black colour, and that the combination of the aldehyde with the excess of the ammonia they use as a condensing agent prevents shrinkage during the final baking of the articles. Owing to the high boiling point of these aldehydes there is no appreciable evaporation at the hardening temperature, and any moisture given off in the formation of the aldehyde ammonia may be taken up with lime.

Carbamide and Formaldehyde

Turning now to carbamide and formaldehyde, the patents of Pollak and Ripper (B.P. 151,016, 171,904, 201,906, 213,567, etc.) deal in great detail with the production from these materials either of glass-like, crystal-clear substances, or of turbid, opaque ones resembling meerschaum, as desired. Here, again, the reaction proceeds in three stages, the first of which may be divided into two "phases," to which Pollak applies the names "condensation" and "polymerisation" respectively. The former takes place in neutral, or better in alkaline solution, but the presence of hydroxyl groups hinders the polymerisation, which must be conducted in an acid medium.

Substitutes for Glass

In the method described in B.P. 213,567, Pollak starts off with pure neutral urea and 30 per cent. formaldehyde, which has been freed from formic acid and rendered neutral or slightly alkaline. He then heats the mixture in a vessel provided with a reflux condenser until the addition of hydrogen ions no longer causes precipitation. He then adds an acid (boric acid is specified in one example) until the concentration of hydrogen ions lies between 10^{-7} and 10^{-3}, when the liquid rapidly becomes viscous. Too much acid causes the reaction mixture to set instantly to a white brittle material retaining all the water, but by carefully regulating the acidity a "hydrophobe" gel is precipitated on cooling.

This whitish resinous material is washed well with water, and separated from any residual (one feels tempted to say "occluded" water) by drying *in vacuo*, when it becomes clear and transparent. This "gel" forms an excellent base for lacquers, and is suitable for use with softening agents, which serve to prevent the lacquer from cracking when heated.

This method apparently obviates a difficulty previously experienced by Pollak with the initial product obtained in his earlier processes, viz., that his viscous solution gradually passed spontaneously into an "irreversible gel," which made it unsuitable for commercial use. Ripper (U.S. 1,460,606) had recommended the addition of salts of a strong base with a weak acid (as, for example, sodium borate or sodium acetate) to act as "stabilisers," and then to counteract this action by the addition of solutions containing many free anions (potassium sulphate, iodide, chloride and sulpho-cyanide are mentioned) to accelerate gelatinisation when desired.

Using this method as above described he was also able to work with a smaller excess of formaldehyde (three or even two molecules formaldehyde to one of urea) in place of the six molecules to one required in B.P. 151,016.

The reaction product is freed from water either as already described or by simply evaporating in a vacuum after obtaining the "hydrophobe" gel. The excess of formaldehyde may be removed by the addition of ureas, phenols, etc., or by destroying it with hydrogen peroxide (U.S.P. 1,507,624). It is then run into moulds and hardened at a temperature exceeding 80° C. in order to obtain the highest water-resisting capacity.

Pollak claims that the resulting product is a perfect substitute for glass in the majority of its applications, lacking only the hardness and heat-resisting capacity of the latter, but compensating for these deficiencies by being less brittle, being readily worked on a lathe, and having a transparency to the ultra-violet rays which gives it special optical properties and renders it peculiarly suitable for use in frames, greenhouses, etc.

American Standard Tests

So important has the subject of synthetic resins become in the United States that the American Society for Testing Materials has drawn up a special specification of "Standard Methods for Testing Moulded Insulating Materials" (A.S.T.M. Standards 1924), the salient features of which are outlined below. "The tests are intended to apply to all solid insulating materials which are formed in moulds by the application of pressure with or without heating."

Tensile Strength (cross section of specimen 1 in. by $\frac{1}{2}$ in.).

Compressive Strength (taken on a 1 in. cube).

Transverse Strength (taken on $\frac{1}{2}$ in. square rod 5 in. long).

In each of the above cases five tests are made on the specimens as received; three are made hot on specimens heated to 10° C. below their distortion temperature for one hour; and two are made on specimens after 48 hours' immersion in water and merely drying off the surface water with a dry cloth.

Dielectric Strength.—These tests are taken on a cup-shaped vessel made to the dimensions shown in sketch. This is floated on mercury, and has a layer of mercury $\frac{1}{8}$ in. deep inside it. The testing frequency shall not exceed 100 cycles per second. For voltages of 50,000 and under a 2 kva transformer is used, and for voltages exceeding 50,000 a 5 kva. Readings are taken on an electrostatic voltmeter with a spark-gap check for high voltages—precautions being taken to avoid high-frequency oscillations.

The standard thickness of the bottom of the cup is 0·197 in., as shown in sketch, but where the puncture value of the dielectric strength is higher than 300 volts per mil, the bottom may be only ·098 in. They point out that this diminution of thickness increases the apparent dielectric strength, sometimes by as much as 50 per cent. Ten specimens are tested under the same conditions as in the other tests, with the exception that before immersion in water the rim of the vessel is dipped in molten paraffin wax to a depth of 1 in. Wherever a specimen punctures through the side instead of through the bottom the specimen is discarded, as experience has shown that this is evidence that the substance was not sufficiently plastic at the time of moulding.

Distortion Under Heat.—Specimen as in transverse test. A special apparatus has been devised for this test consisting of an externally heated oil-bath, within which is an air-bath, equipped with two thermometers, in which the specimen rests on two supports 4 in. apart, and is centrally loaded with a $5\frac{1}{2}$ lb. weight. The temperature is raised 1° C. every two minutes, and the distortion point is reckoned as that at which a deflection of 10 mils is recorded on the micrometer scale with which the instrument is provided. Number of specimens and conditions as in other tests.

Water Absorption.—These tests are made on the cup-shaped

specimens after puncture, and after cutting away the entire rim to a depth of ¼ in. to expose a uniform cut surface. Materials readily softened by heat are dried for 24 hours in a desiccator or at 50° C. plus or minus 5° C. All other materials are dried at 100° C. for 24 hours (again allowing plus or minus 5° C.). They are then cooled in a desiccator and weighed. Then they are immersed in water for 100 hours, wiped with a dry cloth, and weighed immediately. The report states the percentage weight of water present in the sample as received and the percentage taken up in a hundred hours, taking the dry weight as 100 per cent.

No figures are given by the Society to indicate what sort of results are obtained from materials under present consideration, but the following data taken from an account of resins produced by heating phenol and hexamethylenetetramine (Sci. Am. 23/1/15) may be of interest. Tensile strength, 5,000–6,200 lb. per sq. in.; dielectric strength, 105,000 volts per millimetre; resistance, 28 × 10^9 megohms per centimetre cube.

In conclusion, it may be said that German and American patent literature reveals great activity in these countries in devising new plastics from cheap starting materials. One of the most noteworthy appears to be an attempt to make a "substitute for Bakelite" from peat and turf (Plauson D.R.P. 376,743), but a survey of recent developments of the industry cannot be included in the present article.

Results of the Superphosphate Inquiry

Suggestions for Meeting Foreign Competition

Our correspondent, in the following article, enters upon a frank but friendly criticism of the superphosphate industry in this country, and gives reasons for the conclusion that only by mass production, combined with cheap transit charges, modern mechanical appliances, and good costing and staff organisation can the British superphosphate industry be saved.

In the political world, for many decades, there has been keen controversy regarding the merits of free trade and protection. Latterly many business men who were formerly ardent free traders have modified their views, and have reached the conclusion that our free trade system has largely come to mean a system of *free imports*—a fiscal development having vastly different attributes and consequences. Although the country recently declared against protection, the introduction of a Safeguarding of Industries Act cannot be overlooked, because, after all, this measure is of a protective character. It is conceivable that certain embryo industries, which are likely to be of national significance when fully developed, can justify full claims to recognition under the provisions of such an Act. But is there not a tendency to seek aid far too eagerly?

The Superphosphate Committee's Report

No one who has perused and studied the report of the Superphosphate Committee can reach any other conclusion. Indiscriminate application for assistance cannot but be deprecated. The case of the fertiliser manufacturers was apparently lacking in several respects, and certainly was not sufficiently convincing to lead to the necessary steps being taken to impose a duty upon superphosphate.

In making applications of this character it is fatal to exaggerate the importance of an industry, or to overstate the number of workmen employed, or to assume too readily that the industry is suffering seriously from foreign competition. Before an application for assistance under the Act in question is even remotely contemplated, it is desirable and prudent to scrutinise one's business from A to Z, to determine whether greater efficiency cannot be secured at the various stages of the process, and to ascertain unmistakably what are the circumstances which render competition with foreign products possible.

How far these processes (*a*) of self-examination and (*b*) of judicious investigation into the conditions and circumstances obtaining on the continent were pursued one can only judge from the report in question. Certainly the suggestion that the depreciation of currency in France and Belgium operated in such a way as to create a bounty was rendered well-nigh untenable by the fact that the chief source of increased competition emanated from the Netherlands, where no depreciation of currency had occurred. In several other respects there were features about the evidence given which were unconvincing. It is not the writer's intention to deal with these aspects, but rather to offer one or two considerations which may prove helpful to the British superphosphate industry.

Out-of-date Methods

Many superphosphate works in this country are not favourably situated from a geographical point of view. They are not in a position to receive their phosphate rock or pyrites—the two essential raw materials—direct from the port of origin. In such cases transhipment to barges or railway trucks is necessary, and this involves expense of no small importance. Again, at many works which are favourably situated from a geographical point of view, the provisions for discharging steamers and conveying the materials to the precise point on the works where they are required are out of date, inefficient, and expensive to operate. Singularly few of these works use grabs for the removal of the phosphate rock. Many are content to work with skips, which involve about three times the amount of labour, to say nothing of time.

No one who has intimate knowledge of the majority of the superphosphate works in this country, and who possesses a correct appreciation of what is necessary, will deny that manufacturing operations should cease at many works, and should be undertaken by other factories more favourably placed. A system of amalgamation has gradually been proceeding, but one fails to discern that concentration of production at the best situated and most efficient works which is a necessary condition of economical production.

The fact is that, without exception, the superphosphate factories in this country are too small. Few are capable of producing more than 30,000 tons per annum. Many produce less than 10,000 tons per year. Continental and American experts affirm that under present conditions an efficient and economical unit of plant should have a productive capacity of 100,000 tons per annum. *Mass production, combined with cheap transit charges, will undoubtedly be the salvation of the British superphosphate industry.*

If fertiliser works amalgamate, with a view to concentrating and increasing their productive capacity, if they modernise their methods of handling both raw materials and finished products, if they improve their manufacturing process and take steps to secure a general reduction of railway rates, they will have gone far, not only to disarm foreign competition, but to ensure increasing quantities of superphosphate being used in this country. Demand is not fostered by an increase of selling price of any product, but only by cheaper production, which presumably connotes a more favourable selling price. Assistance under the Safeguarding of Industries Act must, in a large number of cases, lead to the very opposite of what is calculated to create an increased demand in this country.

Modern American Practice

Evidence was given before the Committee to the effect that the practice in this country compared favourably with that elsewhere. It is difficult, however, to reconcile this statement with known facts. Any one who has knowledge of the Dutch superphosphate factories will agree that they are ideally situated, and that they manufacture on a much larger scale than the average works in this country. If one refers to American practice, it will be found that some of the works in America are capable of producing 1,000 to 1,400 tons of superphosphate per day of twenty-four hours. The sites of these factories have been carefully chosen; they are to be found on the seaboard, with excellent facilities for sea and railway transport. All this, and much more, has been recorded by an impartial observer and superphosphate expert, Mr. A. Ogilvie, A.M.I.Mech.E., in an article contributed to THE CHEMICAL AGE on March 24, 1924, on "American Practice in the Superphosphate Industry."

Commenting on the grinding of phosphate rock, Mr. Ogilvie observes that " the tendency is to grind to a finer degree." Air separation has apparently rendered this advance possible. The degree of fineness not only facilitates the reaction by which the superphosphate is produced, but it economises the use of sulphuric acid. It is further observed that " the superphosphate dens at most of the large works in America consist of square chambers built in concrete, standing approximately 40 ft. from the ground to the top of the den. Each chamber is about 20 ft. square, open at the top, and holds approximately 250/300 tons of superphosphate, and there are generally four in a line. Two movable mixing platforms are mounted on top of this den, and travel the whole length, making their own seal with any one of the four chambers. On each movable platform are mounted two mixers of the vertical type; two acid measuring machines, and two phosphate weighing scales. The excavation of the den is accomplished by means of an overhead electric crane, with an " orange peel " bucket. The grab bucket is lowered into the den, and it takes about five hours to excavate approximately 250 tons and deposit the superphosphate in the store."

Later Mr. Ogilvie rightly observes that " it is in the compounding of manures that the Americans are ahead of us. They employ high grade machinery for the purpose, and their mixing plants are practically automatic, and designed for large capacities. Nowhere in America does one see hand mixing being done, which is still found in many works in England. . . . The mechanisms employed are all more or less ingenious, and keep the screening surface in a continual and violent state of vibration. The fine material is collected in a hopper, which stands over an automatic mixer. The tailings rejected by the screen are passed to a high speed pulveriser, which powders them in one operation. . . . It only takes a few minutes to mix the batch. . . . The accuracy of these mixers is dependable, and all that can be desired."

The Need of Continuous Operation

Apart from the adoption of modern grinding, mixing, and excavating plant, as well as compounding machinery, it has often occurred to the writer that British fertiliser works could increase their output of superphosphate very appreciably, and thus reduce standing charges, by operating continuously, for the most part, during the months of November to March. Instead of working a day of 8, 10, or 12 hours, as the case may be, if they continued the manufacture throughout the twenty-four hours of the day, production would be materially increased at the expense of very little additional labour. The number of process operators actually engaged in the manufacture of sulphuric acid and superphosphate at a fertiliser works is not very large. It is the day-workers—men who handle raw materials and finished products, and undertake the bagging and loading and other such work, the artisans, bricklayers, carpenters, chemical plumbers, mechanics, etc.—who sensibly add to the number of men employed, and incidentally to the cost of production.

Without doubt, a system of works costing would afford admirable guidance to the management of fertiliser works, as to the weak points to which special attention should be directed. The Majority Report observes that " the difficulty of arriving at a fair judgment of the financial position of the industry arises largely from the fact that all the manufacturers of superphosphate whose accounts were referred to are also makers of and dealers in several, and in some cases many, other commodities. The allocation of costs, or of losses, to one particular product is a matter of accountancy."

There is good reason to believe that the fertiliser industry will not be content to allow foreign competition to grow. It is certain that drastic efforts will be made to meet such competition by reducing manufacturing costs, in the hope that a greater demand will be thereby stimulated.

German Methanol in America

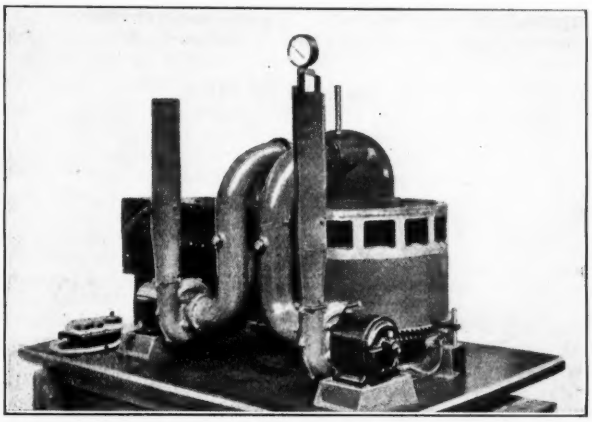
A FURTHER investigation of the alleged dumping of German synthetic methanol on the American market has been undertaken by the U.S. Customs Service, Treasury Department, in spite of the fact that a " no dumping " order was recently issued. The case has been reopened because wood alcohol firms allege that the Customs have been misled by German interests, and Berlin agents of the Treasury Department have been ordered to make another thorough survey.

Silica Gel in Industry

Plant for Drying Air for Blast Furnaces

THERE is an exhibit in the Chemical Section at Wembley this year which is of particular interest to chemists, chemical engineers, and metallurgists. This is the small scale plant for drying blast furnace air with silica gel, which is shown by Silica Gel, Ltd., of 49, Wellington Street, Strand, London, W.C.2. It is notable in being one of the first, if not the first, plant making use of silica gel which has been available for inspection.

In a single blast furnace operating with moist air as much as six tons of water may be drawn in daily, and it is obvious that there is necessarily a considerable waste in converting this water first to steam and then raising it to the working temperature. If the moisture could be removed by utilising heat from waste furnace gases, it is obvious that there would be a considerable saving effected. It is on these lines that the silica gel air drying plant is worked, although in the working model the heating is obtained by a blast of warm air heated electrically. The full size plant is similar in construction but of greater capacity. It consists of a circular tower, divided into twelve segments, each packed with silica gel. The air is drawn in at the top of one of these segments at a time, and passes through the packing of activated gel. Variations in original moisture content up to 80 per cent. saturation



are found to have no effect on the final state of the air which reaches practically a zero value for contained water.

In operation, after a predetermined time depending on the size of the plant, and the volume handled, the tower is rotated automatically through one segment by an electrical timing gear, and the air drawn through a fresh filling of gel. The first segment then comes under the influence of the current of hot air previously referred to, and the gel is reactivated. In this way the time of reactivation considerably exceeds the time of operation, and a satisfactory state of activity of the gel is assured.

The plant shown at Wembley was designed to operate with 30 c. ft. of air per minute, on theoretical considerations; but in practice this expectation has been exceeded, and 100 c. ft. per minute has been found to be a workable figure.

The standard plant is 24 ft. in diameter, and holds four tiers of segments of a depth of about 6 ft. each. This is designed to dry 20,000 c. ft. of air per minute, and should be capable of dealing with 40,000 c. ft. The cost of operation is, of course, dependent on the cost of fuel used for reactivating the gel, which at 40,000 c. ft. per minute would be equivalent to seven tons of coal per day. The power required to operate the plant is said to be about 30 h.p., if no forced draught is used on the furnace, and 10 h.p. more if forced draught is required. The plant can be looked after by one man per shift. A royalty of 6d. per ton of pig iron produced is charged by Silica Gel, Ltd., where this dry blast is used, and the cost of erection would be from £10,000 to £12,000. It is stated that air-drying plants, when conditions are suitable, pay for themselves in two or three years in the fuel saved in the furnace itself.

W. J.

The Twilight Zone of Matter.—(I.)

By Dr. Alexander Findlay

By the courtesy of the American Chemical Society we are able to publish the address on "The Twilight Zone of Matter" that Dr. Alexander Findlay of Aberdeen delivered at the recent meeting of the American Chemical Society at Los Angeles.

WHEN we crush and grind the ordinary coarse matter which we can see and handle, we can break it up into smaller and smaller particles. At first these particles may still be seen by the unaided eye, but as the process of grinding is continued, the particles become so small that they can be distinguished only with the help of a lens or of a microscope. One can, in imagination at least, and indeed also in actual practice, carry the process of sub-division of matter still further, so that the particles become too small to be seen even with the aid of the most powerful microscope, and we may continue the process of sub-division until we reach, at length, the ultimate limit or degree of sub-division, the molecule, beyond which farther sub-division is impossible without destroying the chemical nature of the substance.

Since the smallest particle of matter directly visible under the microscope is perhaps about a thousand times larger than the simplest molecule, there exists, as you will understand, a considerable range of sub-division of matter lying between the limits of the microscopically visible and the molecular states; and it is to this intermediate zone or range of sub-divisions of matter that I have ventured to apply the term, the twilight zone of matter. It is to this range of sub-division of matter that, in more scientific language, the term "colloidal state" of matter is applied.

The Colloidal State

Not only does matter in the twilight zone of sub-division present many problems of peculiar fascination to the seeker after a fuller knowledge of natural phenomena, but the important role which colloidal matter plays in almost all the diverse fields of human activity appeals also to the man of more practical instincts. In agriculture and in the tanning of leather, in the working of clay for the manufacture of the common brick or for the production of the finest porcelain, in the production of artificial silk and of smokeless ammunition, in the dyeing of textile fibres and in the production of the blue of the sky or the blue of the eye, the colloidal state of matter plays a part. When, further, we recall that nature has selected matter in the colloidal state to be the vehicle of life and as the medium in which all life processes take place, the importance and interest of a study and knowledge of the twilight zone of matter become obvious.

It was, as you will remember, the Scottish chemist Graham who first discovered a useful method of distinguishing between the molecular state of sub-division and the state of sub-division known as colloidal. Certain substances in solution were found to diffuse through parchment paper or animal membrane, whereas other substances could not do so; and since the substances which did not diffuse through parchment paper were thought to be non-crystallisable and of the nature of gelatin, glue, and similar materials, Graham called these substances colloids, from the Greek word for glue. Substances which diffused through parchment paper and which existed in solution in the molecular state of sub-division, substances like sugar and salt, for example, were called crystalloids. Although we recognise the imperfections of Graham's classification, the distinction drawn by him is one of considerable practical importance, for the process of dialysis, discovered by Graham, gave a means of distinguishing between moleculary dispersed matter and matter in the so-called colloidal state. Since the peculiar and characteristic properties of the twilight zone of matter do not depend on the physical state of the finely sub-divided matter or of the medium in which the matter is dispersed, we shall find the colloidal properties exhibited not only by colloidal suspension or colloidal emulsions, where we have solid particles or liquid droplets dispersed in a liquid medium, but by smokes (solid particles in a gaseous medium) mists (liquid droplets in a gaseous medium), forms (gas bubbles in a liquid), and so on.

While it could be inferred from the experiments of Graham that the colloidal systems, although apparently homogeneous like a solution sugar are nevertheless heterogeneous and contain particles which have a magnitude greater than molecular, the actual incidence of such particles has been rendered evident by the scattering of light by these particles and the so-called Tyndall effect, and the introduction of the ultra-microscope by Liendenhopff and Zsigmonde has enabled the eye to detect the presence of particles of a magnitude of about six millionths of a millimetre, which is about 60 times the dimensions of a hydrogen molecule. By the use of ultra-violet light and the use of a photographic plate instead of the eye, particles of still smaller dimensions can be detected. This fact has proved of great value in bio-chemistry in the examination of filterable viruses, as in the case of the virus of cancer, according to recent announcements from London.

In the scattering of light by finely divided particles, it is mainly the light of shorter wave length that is scattered and the light which reaches the eye is therefore blue in colour. The very fine smoke rising against a dark background appears blue, but when the smoke is viewed against a background of white cloud, that is, by the transmitted light, the smoke appears reddish brown in colour. In the same way, as Leonardo da Vinci suggested long ago, one may explain the blueness of the sky by the scattering of the sunlight by finely dispersed particles in the atmosphere (or, as is now thought, by the molecules of the atmospheric gases themselves), the background being the blackness of infinite space. The blue colour of the eye and the blue colours of feathers are similarly to be explained, as Bancroft has so fully shown, by the scattering of light by finely dispersed matter.

Adsorption

In the case of matter in the colloidal state, we are dealing, as has been said, with matter in a very fine state of sub-division, so that the extent of surface exposed is very large relatively to the total volume of the matter. Surface forces, therefore, play a predominant part and bring about changes in the distribution or concentration of matter at the surface of the particles.

This change of concentration at a surface, brought about by surface forces, is spoken of as adsorption. We see the effect of adsorption, for example, in the removal of colouring matter from solution by the very porous material charcoal. By reason of its large surface, and high adsorbing power, charcoal was employed, during the war, in the construction of gas masks for the adsorption of so-called poison gases—many of which were not gases at all, but finely sub-divided solids—colloidal smokes. Similarly, the recently introduced highly porous silica gel is used for the recovery of volatile solvents, and for the removal, by preferential adsorption, of gasoline from natural gas, and for freeing crude petroleum from deleterious sulphur compound.

In the production and characterisation of colloidal systems, adsorption plays a part of the highest importance by the adsorption of ions from the dispersion medium, or from electrolytes, present in the solution. The colloidal particles acquire an electric charge. Adsorption of the dispersion medium as a whole may also take place to a greater or less extent, whereby variation in the general behaviour of colloids may be produced. In some cases, in the case of the so-called suspension colloids or hydrophobe colloids, like colloidal solutions of gold, or arsenious sulphide, the dispersed particles may adsorb none or practically none of the dispersion medium and they exist therefore in suspension as non-hydrated particles, the stability of which is due to their elastic charge and to their Brownian movement. In the case of the so-called emulsoid or hydrophide colloids, like solutions of gelatin or starch, adsorption of the dispersion medium itself takes place, and the stability and properties of such a colloidal solution are due to this adsorbed water as well as to the electric charge of the particles. The greater the extent to which adsorption of the dispersion medium takes place, the more will the stability and properties of the colloidal solution be dependent on this adsorbed medium and the less will they depend on the electric charge. If the electric charge on a suspension colloid be neutralised, agglomeration of the particles followed

by precipitation takes place, and this neutralisation of the electric charge can readily be effected by the addition of electrolyte.

Negatively charged colloid particles will preferentially adsorb the positive ions of the added electrolyte, and positively charged colloids will preferentially adsorb the negative ions. The charge on the colloid is thereby neutralised. Although multivalent ions are in general, according to Hardy's rule, more effective in producing precipitation than univalent ions, recent investigation shows that there is no exact relationship between valency and precipitating power. In the precipitation of colloidal sulphur, caesium is a hundred times more effective than the lithium ion and has a greater precipitatory power than the bivalent ions of zinc, cadmium, or nickel.

The precipitation of fine particles by electrolytes is well illustrated on a large scale in nature, the finely divided clay carried by many rivers being caused to deposit when the river water mingles with the sea. In this way, the silting up of river mouths and the formation of deltas is caused to take place.

The electrical charge on a colloid particle may be neutralised not only by the ion of an electrolyte, but also by another colloid carrying an electric charge of opposite sign. Colloids of opposite sign may mutually precipitate each other and produce adsorption. Purple of cassius, for example, is an adsorption complex of stannic oxide and colloidal gold.

Adsorption in Dyeing Processes

The process of adsorption plays an important part in the dyeing of textiles and the staining of animal tissues. In this case, the negatively charged colour ion of the acid dyes will be predominantly adsorbed by a positively charged fibre, and a positively charged dye (basic dye) will be predominantly adsorbed by a negatively charged fibre. In an acid both the positive charge and the fibre is increased by adsorption of hydrogen ions and adsorption of a negative or acid dye by the fibre is increased. On the other hand, in alkaline solution the negative charge on the fibre is increased, and adsorption of a positive or basic dye by the fibre is increased. In the case of substantive dyes, the dye itself is in colloidal solution and addition of electrolyte, in small amount, will increase the dye absorption by diminishing the stability of the colloid.

Where mordants are used, we again have adsorption taking place, the mordant, a colloid, adsorbing the dye from the dye bath and fixing it on the fibre. It is really the mordant that is dyed, not the fibre. After the dye has been adsorbed, secondary changes may take place, leading to the formation of a non-stable adsorption complex.

In the case of colloidal solutions of the type of gelatin solutions, the stability of the colloid is due mainly to absorbed water or adsorbed dispersion medium, and consequently, such solutions are not so sensitive to added electrolytes. Even although the addition of small amounts of an electrolyte may produce changes in the amount of water adsorbed by the colloid, actual precipitation does not take place until the concentration of added electrolyte is relatively large. The relatively great insensitiveness to electrolytes which is shown by hydrophide colloids of the type of gelatin, may be transferred to hydropholic or suspensoid colloids of the type of colloidal gold.

When gelatin, for example, is added to a colloidal gold solution, the gold is adsorbed by the gelatin, and a much greater concentration of electrolyte is required in order to precipitate the gold that is necessary in the absence of the gelatin. The gelatin is said to protect the gold. This so-called protective action, which varies greatly in the case of different hydropholic colloids, is of much importance in many directions.

In the case of such rivers as the Mississippi, and the Nile, the water is always turbid and muddy, owing to the fact that there is present a large amount of colloidal organic matter which stabilises the fine suspension of clay and soil; and it is only when the rivers reach the salt water of the sea, with its high concentration of salts, that the finely dispersed mud is precipitated. In the case of the river Ohio, on the other hand, the water is at times clear, owing to the absence of protective colloride and the presence of lime and other salts which act as precipitating agents. By the use of protective colloride, also, soluble substances produced by chemical machines can be kept in a colloidal state and so prevented from undergoing fluctuation and sedimentation. In the production of the photographic plate, the silver bromide is prevented from forming a precipitate of coarse particles unsuitable for photographic purposes, and is kept in a finely divided form.

In many physiological processes, likewise, the protective action of hydrophile colloids may play an important part. The nature of the curd which separates from milk and the readiness with which it is formed are greatly affected by the presence of protective colloids. In cow's milk there is a relatively large amount of casein, and a relatively small amount of the protective-colloid. Cow's milk, therefore, readily curdles. In human milk there is a smaller proportion of casein, and a larger proportion of lact albumin, so that the casein is more effectively protected, and curdling takes place less readily. In asses' milk, the relative proportion of protective colloid is highest of all, and curdling takes place with greatest difficulty. The digestibility of asses' milk is in consequence greatest. By increasing the amount of protective colloid in cow's milk, by addition of gelatin or white of egg, or even of barley water (starch) curdling takes place less readily and the digestibility of the milk is increased. The smoothness of a good ice cream also is due to protective colloids, such as gelatin or white of egg, which prevent the coagulation of the casein and keep the crystals of ice extremely small.

Many colloids of the hydrophile type, *e.g.*, gelatin, fibrin, etc., exhibit, when cooled, the property of passing into a jelly, by a coalescence of the hydrated colloid particles. The jelly so formed may be dried, and is then obtained as a more or less hoarlike material, such as ordinary dry gelatin. These jellies have the important property of taking up or imbibing water, even against very great pressures. This imbibing power or water holding power of colloid jellies is of great biological and agricultural importance. The amount of water imbibed is greatly affected by the presence of electrolytes, being increased by acids and alkalis, up to a certain concentration, but the increased swelling produced by dilute acids is diminished by the addition of salts.

In the remarks I have so far made, I have sought to give a brief summary of the properties of matter in the twilight zone of subdivision, and to indicate their importance in various natural and industrial operations.

Confessions of a Capitalist

UNDER the title of *The Confessions of a Capitalist* (Hutchinson and Co., 18s.), Sir Ernest J. P. Benn, Bart., has written a book which is now in the press, and will appear towards the end of this month. The book is not concerned with presenting to the troubled business world of to-day a bland impersonal philosophy for leisured contemplation in the cloister or the study. The author is offering the actual working faith of a modern successful business man, living in constant touch with the realities of business life, stated in the vivid terms of a personal narrative. The book is, from the first sentence to the last, intensely intimate and even confidential; it reveals with a rare frankness the point of view, the inner working, the methods and the objectives of the typical business mind. Such a book is not written to please any particular party or group. It is written to disclose facts and to provoke attention to their meaning.

Mr. J. E. Davidson

FOLLOWING upon his recent retirement from the board of the United Alkali Co., Ltd., Mr. John Edward Davidson has resigned from the directorate of the Newcastle Exchange Co., Ltd.

Mr. Davidson has been associated with the chemical trade of the port for 60 years, and his experience goes back to the time when this was one of the most important and flourishing industries in the Tyneside district.

In his early days there were 26 alkali works in operation in the Tyne district, producing soda ash, caustic soda, soda crystals, bicarbonate of soda, bleaching powder, and other chemicals. The industry is now represented by two works only—one at Gateshead, known as Allhusen's Chemical Works, and the other at Hebburn, of which Sir Charles Tennant and Partners were formerly the proprietors. Both these concerns are now owned and controlled by the United Alkali Co. In addition to setting up works in the Cheshire district, the United Alkali Co., he was also associated with the introduction of electrical energy into their Gateshead works, for the manufacture of chlorine, bleaching powder, and caustic.

British Association at Southampton

The Commercial Marketing of Peat

DR. R. MOLLWO PERKIN, in a paper on "Recent Progress in the Peat Problem," referred to the many failures there have been in endeavouring to deal with the commercial marketing of peat, and described a new system. For the recovery of by-products or for use as a fuel, he said that it is necessary to dry peat down to 20 per cent. moisture or less, especially if peat coke was to be one of the by-products. The quantity of peat in the United Kingdom and Ireland amounted to over 8,000,000 acres, and probably each acre would yield from 3,000 to 3,500 tons of such dried peat.

Methods suggested of getting rid of the water in peat were: 1, Macerating; 2, heating and compressing; 3, electrical; 4, chemical; 5, macerating, heating under pressure and briquetting. Macerating had been adopted for a number of years in Denmark and by the Low Temperature Carbonisation Co. in Dumfriesshire, as well as in Sweden, but it had not proved to be economical. Peat properly treated, however, could when briquetted be successfully used on a low temperature distillation plant for the production of charcoal for metallurgical purposes, oils and wax, sulphate of ammonia and acetic acid. Several pulping machines had been devised, the object of which was to obtain briquettes for carbonising so as to obtain peat charcoal and by-products.

It was stated that the Power Gas Corporation had plants working in Italy which were giving extremely good results. The Corporation claimed that with a peat containing a good nitrogen content the sulphate of ammonia produced more than paid all the costs, so that power gas cost practically nothing. In this connection, however, attention was called to the heavy capital expenditure.

The Briquette Process

Dr. Perkin said that he had found that a combination of maceration under suitable conditions in extruding as much water as possible, and then passing it into an autoclave and heating under regulated pressure, which caused a certain rise in temperature, and then suddenly discharging by means of a sluice valve and afterwards filtering or pressing off the necessary water, with a final passing of the peat so treated into a press, gives briquettes containing only 18 to 20 per cent. of water. It was possible to obtain such briquettes in eight hours from the time the peat left the bog, the briquettes being very hard and ready for transport. When these briquettes were carbonised under suitable conditions, the charcoal so obtained compared most favourably with the wood charcoal now employed in the steel industry and which was generally obtained from Sweden. The peat charcoal, it was stated, was of a much better quality. The following analyses of the wood charcoal and peat charcoal were given :—

	Per cent.
Wood charcoal as received—	
Total volatile matter	33·60
Moisture	6·0
After drying—	
Volatile matter	29·60
Ash	4·46
Fixed carbon	66·18
Sulphur	0·51
Phosphorus	0·055
Peat charcoal—	
Total volatile matter	17·00
Moisture	5·0
After drying—	
Volatile matter	11·93
Ash	4·56
Fixed carbon	83·51
Sulphur	0·26
Phosphorus	0·015

As for metallurgical purposes the fixed carbon was the most valuable, low sulphur and phosphorus content was most essential, and the volatile matter, if high, was mostly wasted; it followed that peat charcoal was better than wood charcoal and would consequently fetch a higher price.

Dr. Perkin then gave analyses of various peats :—

SCOTCH (ARGYLLSHIRE).—*Macerated and briquetted peat.* Air dried :—Specific gravity, 1·29; volatile matter, 51·41 per cent.; moisture, 15·12 per cent.; fixed carbon, 31·97 per cent.; mineral matter, 2·50 per cent.; nitrogen, 2·66 per cent.; sulphur, 0·27 per cent.; calorific value, 8,558 B.Th.U.

This peat, when carbonised on a low temperature system at a temperature of 500° to 550° C., gave about 5,500 c. ft. of gas per ton of peat retorted, which was more than sufficient to heat the retort after the distillation had once been started. The composition of the gas was as follows :—Hydrogen, 19 per cent. by volume; methane, 11·5 per cent.; carbon monoxide, 14·4 per cent.; carbon dioxide, 31·4 per cent.; ethylene, 3·4 per cent.; nitrogen, 19·9 per cent.; oxygen, 0·4 per cent. The amount of CO_2 was high, and it might be advisable, if the gas was to be used for heating the retort, to eliminate a portion of this by passing the gas over lime. 0·34 ton of good hard charcoal was obtained, and 30 gallons of thick tar containing about 8 per cent. of paraffin wax. The test was conducted on a comparatively small scale, and bearing in mind the high volatile content of the peat one might expect to obtain a better yield of oils when worked on a commercial scale. The aqueous vapour contained ammonia, acetic acid, and methyl alcohol. The yield of sulphate of ammonia was about 10 lb. per ton of peat carbonised, which was poor, but the temperature of carbonisation was low.

Detailed Analyses

BRIQUETTED YORKSHIRE PEAT.—Volatile matter, 54·10 per cent.; fixed carbon, 30·10 per cent.; ash, 2·80 per cent.; moisture, 13·0 per cent.; sulphur, 0·35 per cent.; phosphorus, 0·012 per cent. The charcoal obtained by carbonising this peat was very dense and hard, the specific gravity being 1·72.

SCOTCH PEAT (LANARKSHIRE).—Volatile matter, 69·50 per cent.; fixed carbon, 28·50 per cent.; ash, 1·38 per cent.; sulphur, 0·62 per cent. This peat was carbonised on a modified Del Monte retort at a temperature of about 500° C. A good hard coke was obtained, but the amount of volatile matter was too high for it to be employed for metallurgical purposes. This could, however, be got rid of by heating to a high temperature or working the retort more slowly. The analysis of the coke was as follows :—Volatile matter, 10 per cent.; fixed carbon, 88·16 per cent.; ash, 1·84 per cent.; sulphur, 0·60 per cent. The yield of crude tar was 31 gallons per ton of crude peat carbonised. The yield of sulphate of ammonia was 20 lb. and the coke 0·3 ton. On fractionation of the crude tar, the following results were obtained :—fuel oil, 15·7 gallons; paraffin wax, 21 lb.; phenols, 1·6 gallons. The graduation into fuel oils, paraffin wax, and phenols, however, only gave a rough idea as to the constituents of the tar. The 15·7 gallons of fuel oil contained about 1·5 gallons of a light oil which could be employed for motor cars; consequently it did not comply with the Admiralty specifications for fuel oil. By taking off the lower fractions, however, a fuel oil complying with these specifications could be obtained. This fuel oil was remarkably fluid.

From a peat containing from 50 to 60 per cent. of moisture, carbonised on the retorts of the Tarless Fuel Syndicate, the following products were obtained :—water-free tar, 8·8 gallons; sulphate of ammonia, 21·2 lb. The amount of moisture in the peat was too high for satisfactory carbonising because of its cooling effect on the retorts. It followed, therefore, that peat containing more than 20 per cent. moisture could not be satisfactorily carbonised by low temperature processes.

Cheap Commercial Production Possible

Dr. Perkin said that it was impossible for him to give full details of the process he had outlined, but he claimed that it is now possible to produce peat commercially at a price much lower than that of coal, and it would be a great pity to allow other nations to be the first to work it on a proper scale. British peat, as he had proved by a number of analyses, is superior in all respects to European and other peats, and now was the time to start a new home industry and, to some extent at least, reduce unemployment.

It had been suggested to manufacture alcohol by a process of fermentation, and this had actually been done. Paper had also been made from peat pulp, but the great difficulty had been to get rid of the enormous quantity of water with which peat was always accompanied. With the new process Dr. Perkin claimed to have got over this difficulty and to be able to briquette peat in a manner which would enable it to be used for many purposes on a commercial scale, and to compete with coal in some respects.

Economical Standardisation

Considerable Saving Results

MR. C. LE MAISTRE, secretary of the British Engineering Standards Association, read a paper, in the Engineering Section, on the present position of standardisation.

The simplification and standardisation of steel sections, he said, had resulted in a saving of 5s. per ton to the steel industry, whilst recently a single electrical specification resulted in a saving of £10,000 in the stock which one company alone had to carry, or a continuous saving of £500 per annum. Since the war many other countries had instituted national organisations, and in practically all cases they had drawn on the experience of the B.E.S.A.

Among the results of these efforts, which began in 1921 in the U.S.A., were the following :—The American milling cutter industry, after months of study and survey, made a reduction of 35 per cent. in prices. A reduction of 50 per cent. had been made in the sheet metal industry in certain lines. The china trade, the paper bag industry, the lumber industry, and many others offered examples of reductions in varieties and consequently in prices through the application of the principles of simplified practice, upon which the U.S.A. Government was now spending £20,000 per annum.

After pointing the directions in which similar results can be achieved in this country through the medium of the B.E.S.A., a plea was made for a greater measure of financial support for the work being, and to be, done. At present the general funds were provided largely by industry, and, to a very small extent, by the Government (to be exact £100 per annum). It was computed that the total value of the support given by industry was about £40,000 per annum. Considering, however, the large sums of money being devoted to similar work elsewhere, the hope was expressed that the British Government would recognise the value of the work.

Reorganisation of Membership

In order to widen the scope of the membership, the Main Committee was, in October, putting into operation a scheme for the reorganisation of the membership. The members of technical committees of the Association were to be known as honorary members and a new class of membership was being formed to include professional engineers, individual firms, and business men connected with the great industries of the country, who were to be invited to become members at a minimum annual subscription of two guineas.

Discussion on Carbon Chains

FOLLOWING the papers presented at the British Association meeting (already reported in THE CHEMICAL AGE of September 5) there was a discussion on Tuesday, September 1, on "The Alternating Effects in Carbon Chains."

PROFESSOR C. H. DESCH said that the subject had been occupying a great deal of attention recently, and, although it had been suggested that it had been sufficiently threshed out in the technical press, he was certain the Section would welcome the opportunity of discussing the matter.

DR. B. FLURSCHEIM said that an alternating effect in carbon chains was now generally admitted, but did it consist of alternating amounts of free and bound affinity force ("affinity theory"), or of varying distributions of electrons ("polarity theory")?

The polarity theory defined the attractive force between non-ionised atoms as an electrostatic attraction between shared electrons and the atomic nuclei. But instead of forming a bridge between the physical structure of the atom and its chemical behaviour, this conception created difficulties both physical and chemical.

The affinity theory, accepting the attractive force between non-ionised atoms—like gravitational and magnetic forces—as some given function of the atom, deduced for this force one single mechanism of transmission, in any chain. Its interpretation of chemical reactions was unequivocal, and was found to be in agreement with all well-authenticated observations.

PROFESSOR T. M. LOWRY, F.R.S., said that the important aim should be to get at the mechanism, and when that was obtained the rest would follow.

PROFESSOR A. LAPWORTH, F.R.S., suggested that the theory which he had put forward in 1901 was practically the same theory that he held now, but Dr. Flurscheim's theory was not really a theory at all.

PROFESSOR R. ROBINSON, F.R.S., said there had been so much discussion of this problem at Manchester that it was very difficult to say exactly who was responsible for any particular idea. The fundamental distinction between the theories of Dr. Flurscheim and those who supported the polarity theory of Professor Lapworth, Professor Lowrie, and himself was that Dr. Flurscheim assumed an unequivocal distribution, so that it should make no difference in Dr. Flurscheim's case whether a substance was acted upon by a positive or a negative ion. As a matter of fact, it made a great deal of difference.

DR. BOYD said that those in Southampton were very much interested in hydrolysis, which was intimately connected with the theory of polarity. His own investigations had shown him the necessity for making theories fit the facts, and he pointed out two instances in which Professor Robinson's theory did not fit the facts. He felt that the whole question of hydrolysis deserved further discussion, and suggested that perhaps Professor Robinson's original paper was too condensed to represent his point of view now.

The openers of the discussion briefly replied, and the proceedings of the Section closed.

Ceramic Society, Refractory Materials Section

THE sixteenth meeting of the Refractory Materials Section of The Ceramic Society will be held in the Meeting Room, The Chemical Society, Burlington House, London, W.1, on Wednesday and Thursday, September 16 and 17, 1925. The President, Mr. Frank West, will preside. The Council meeting on Wednesday, September 16, at 2.30 p.m., in the Council Room, is open to members of Council only. The General Meeting for the election of officers, etc., will be held on Wednesday, September 16, at 3 p.m., in the Meeting Room. This meeting is open to all members of the Society.

Owing to the difficulty of predicting how long discussions will take, the papers will be taken in the order named as time permits. Those for which there is not time will be taken as read and printed in the Transactions of the Society after approval by the Publication Committee. Any communicated discussions, with the author's reply, will be published at the same time.

Papers on Wednesday, September 16, will be :—10 a.m., "The Influence of Foreign Matter on the Thermal Expansion and Transformations of Silica" (Messrs. J. F. L. Wood, H. S. Houldsworth, B.Sc., and Professor J. W. Cobb); "Refractories for the Pottery Industry" (Mr. W. Emery); "Low Temperature Burning of Stourbridge Fireclays" (Mr. C. E. Moore); "A Further Note on the Storage of Silica Refractories" (Mr. W. J. Rees, B.Sc.).

At 7.30 p.m. dinner will be served at Holborn Restaurant, and on Thursday morning the Presidential address will be delivered by Mr. Frank West, followed by "Tunnel Kilns for Firebricks, Part I," (Mr. S. R. Hind, B.Sc.), and "A Note on some Cases of Spalling of Silica Bricks in Gas Retorts" (Mr. W. J. Rees, B.Sc.), all papers subject to variation in set times if affected by discussion.

Dyestuff Licences for August

THE following statement relating to applications for licences under the Dyestuffs (Import Regulation) Act, 1920, made during August, has been furnished to the Board of Trade by the Dyestuffs Advisory Licensing Committee :—

The total number of applications received during the month was 392, of which 281 were from merchants or importers. To these should be added 17 cases outstanding on July 31, making a total for the month of 409. These were dealt with as follows : Granted, 276 (of which 254 were dealt with within 7 days of receipt). Referred to British makers of similar products, 82 (of which 61 were dealt with within 7 days of receipt). Referred to Reparation Supplies available, 27 (all dealt with within 2 days of receipt). Outstanding on August 31, 1925, 24. Of the total of 409 applications received 342, or 84 per cent., were dealt with within 7 days of receipt.

Use of Barium Polysulphide in Flotation

In a recent publication of considerable interest the United States Bureau of Mines discusses the filming of minerals in oxide ores with the object of increasing the efficiency of recovery in the flotation process. This preliminary method of treatment with various mediums is, of course, no novelty, but up to the present the utilisation of barium polysulphide for the purpose does not appear to have been considered, and it is thought that it may prove to have many advantages over other reagents. For the investigation two fairly typical oxidised ores of copper and lead were selected. The copper ore assayed 3·8 per cent. Cu; and was present in a sandstone gangue, mainly as the carbonates, malachite and azurite, with less than 0·2 per cent. as sulphides, or silicate. The lead ore assayed 5·15 per cent. Pb and 14·3 oz. Ag.

The sulphidising reagents used were hydrogen sulphide, ammonium polysulphide, and sulphides and polysulphides of the alkaline and alkaline-earth metals. The methods used in the preparation of these reagents are given below.

Hydrogen sulphide—H_2S. Gas from a generator was passed into water until the solution was saturated.

Ammonium polysulphide—$(NH_4)_2Sx$. Five hundred c.c. of aqua ammonia (28 per cent. NH_3) was diluted to 800 c.c., and H_2S gas passed through for 30 minutes, 25 gm. of sulphur being added as the gas was bubbling through the solution. The solution was then heated slowly to 50° C., a further addition of 25 gm. of sulphur made, and H_2S gas again passed through for 30 minutes. The resulting solution was filtered, diluted to one litre, and found to contain 38 gm. of sulphur per litre.

Potassium polysulphide—K_2Sx. 20 gm. of sulphur and 20 gm. of potassium hydroxide were boiled together in a litre of water for one hour, and the resulting solution diluted to 2 litres. All the sulphur dissolved.

Sodium sulphide—Na_2S. A 5 per cent. solution of commercial sodium sulphide—60 to 62 per cent. Na_2S—in water was prepared.

Sodium polysulphide—Na_2Sx. Caustic soda and sulphur were boiled together in water for 30 minutes, the resulting solution containing 20 gm. NaOH and 32 gm. S per litre.

Calcium polysulphide—$CaSx$. Commercial quicklime and sulphur were mixed with water to form a paste and then boiled in water for one hour, the resulting solution containing 10 gm. CaO and 20 gm. S per litre. The ratio of lime and sulphur were varied somewhat without apparently affecting the solution for flotation purposes.

Barium sulphide—BaS. The residue of a reducing roast of a mixture of barium sulphate and charcoal was leached with water, the solution containing 30 gm. of BaS per litre.

Barium polysulphide—$BaSx$. This reagent was prepared by two methods: 1st, equal parts by weight of barium hydroxide and sulphur were boiled together in water for one hour, the solution containing 10 gm. of BaOH and 10 gm. of S per litre; 2nd, the residue of a reducing roast of barium sulphate and charcoal was leached with water, and the resulting solution was boiled with sulphur. The final solution of barium polysulphide contained 12 gm. of Ba and 16 gm. of S per litre.

Sodium sulphide and paraffin. This reagent is a patented mixture controlled by the Eureka Metallurgical Co., Salt Lake City, Utah. It is prepared by melting together equal parts of commercial sodium sulphide and paraffin. The mixture is then tumbled in a pebble mill with the ore for ten minutes. Flotation follows either with or without additional amounts of sodium sulphide.

Procedure in Tests

Both ores were crushed to 10 mesh and carefully sampled. As preliminary experiments had shown that fine grinding was required, the ore for all tests was ground to pass a 65-mesh screen. For frothing and collecting purposes, the reagents used were coal tar, coal-tar and hard-wood creosotes, ortho-toluidine and thiocarbanilide (T and T mixture), and pine oil, in amounts of 1 to 3 lb. per ton of ore depending upon the reagents used. Other than a small amount of pine oil used in the flotation machine during the run, the oils were ground with the ore in the pebble mill. With the exception of the sodium sulphide-paraffin mixture noted above, the sulphidising reagents were all added to the pulp in the flotation machine. About one-fourth of the reagent was added, while the froth was first forming in the machine, and the remainder at intervals during the first twenty-two minutes of the run. The total time of treatment was 35 minutes. Tailings and rough concentrates only were made, as it was thought that these results would give a satisfactory comparison of the value of the different sulphidising reagents. In all the tests the amounts of the reagents used approximated the usual proportions used in practice.

In the series of tests made on a sample of ore from the Chino Copper Co., calcium and barium polysulphides were used as the sulphidising reagents. The tailings made in 15 tests using calcium polysulphide averaged 0·18 per cent. total copper and 0·11 per cent. nonsulphide copper. These results compare with the tailings of 0·14 per cent. total and 0·10 per cent. nonsulphide copper, which were the averages of eleven Bureau of Mines tests using barium polysulphide. The amounts of the reagents used in pounds per ton of ore treated were 4 lb. of sulphur and 2 lb. of lime as calcium polysulphide, and 3·5 lb. of sulphur and 7 lb. of barium hydroxide as barium polysulphide.

Comparative Results

From the results of this investigation it would appear that barium polysulphide has possibilities as a sulphidising reagent. On the copper ore the extraction and grade of concentrates were about as good as were obtained from any of the sulphidising reagents used. On the lead ore, however, barium polysulphide did not give as high an extraction as was secured with a combination of sodium sulphide and polysulphide, or the sodium sulphide-paraffin mixture. Barium polysulphide prepared by either of the two methods seemed to have about the same sulphidising effect. In districts where deposits of the barytes occur, barium polysulphide might be prepared cheaply, and prove to be a satisfactory reagent.

Of the other sulphidising reagents considered sodium sulphide and sodium polysulphide, either separately or as a combination, gave the best results. Calcium polysulphide used alone did not yield as good results as had been expected, as it has been somewhat favoured in the past by investigators, partly because of its comparative cheapness. Sodium sulphide and calcium polysulphide as a combination proved to be satisfactory for the copper ore, and at least one of the companies treating oxidised copper ores uses this combination successfully. Potassium and ammonium polysulphides are too expensive for commercial practice, particularly as at least equal or larger amounts of these reagents are needed than is required with the cheaper sulphidising reagents. In no case in the amounts used did hydrogen sulphide prove to be as satisfactory a sulphidising reagent as some of the others. Also, as only the amount of gas actually absorbed in water was determined, the total amount of hydrogen sulphide gas generated was much higher.

Germany's Aniline Dye Trade Declining

The German aniline dye trade has declined 65 per cent. in Europe and 56 per cent. in other countries of the world compared with 1913, according to *Deutsche Bergwerks Zeitung*. Dr. Kurt Wimmer, of Dusseldorf, states that in 1913 Germany produced 80,000 metric tons of dyestuffs, of which 64,000 tons were disposed of in the markets of the world and satisfied 75 per cent. of the world's requirements. The portion of this consumed in Europe was distributed as follows: Great Britain, 11,000 tons, or 33 per cent.; Austria-Hungary, 18 per cent., Italy, 13 per cent.

Maximum production realised in Germany since the war was 15,257 tons in 1922; against 11,464 tons in 1923; 9,832 tons in 1924, and 144 tons for the first three months of 1925. Imports into Germany, which totalled 2,552 tons in 1913, were 103 tons in 1922; 59 tons in 1923; 83 tons in 1924; and rose sharply to 203 tons in the first three months of 1925.

Dr. W. Fleming, of Dusseldorf, stated that competition from American dye manufacturers, who in 1923 produced 96 per cent. of their home consumption and exported a quantity valued at many millions sterling, was far more important than British competition. Exports of German dyes to America in 1923 totalled 373 tons against 13,885 tons in 1913. The only way to overcome foreign competition lay in lower production costs brought about by improvements in production methods, he says. The manufacture of synthetic raw materials promised increasing success.

Synthetic Camphor and Phenol

French Commercial Processes

AMONG the industries recently set up in France attention is drawn by the Paris correspondent of *Chemical and Metallurgical Engineering* to that of synthetic camphor established by the Société Alsacienne de Produits Chimiques at the Vaugouin plants near La Rochelle. Synthetic camphor had already been manufactured in France, first at Bonnières after the process of Behal and Dubosc, later under the process of the Fabrique Bâloise de Produits Chimiques and at the plants of de Laire in Calais. The first of these pre-war plants had to close after having lost much money. The second stopped manufacturing as soon as the business became unprofitable.

As to the Société Alsacienne de Produits Chimiques, it uses the process of tetrachlorophthalic acid. This acid is condensed with pinene, the principal constituent spirit of turpentine. The result is dibornylic ester, which is then saponified by caustic alkali in borneol with recovery of tetrachlorophthalic acid which, being little soluble in water, is easily regenerated. It only remains to oxidise the borneol in camphor according to the known process.

The interest of the process lies especially in the fact that the tetrachlorophthalate of borneol is not volatilisable in contact with steam. One can therefore, when the reaction is finished, eliminate the terpenes and the secondary volatile products by means of steam. Bornylic ester remains. In former processes where oxalic acid, acetic acid or formic acid was used, volatile bornylic esters were formed, but they were much more difficult to isolate from the non-transformed products. In spite of that the process of the Sté. Alsacienne de Produits Chimiques does not yield a production of more than 20-25 per cent. with turpentine and from 35 per cent. to 40 per cent. with rectified spirit. It is said that the company has been able to better these productions materially. At any rate it produces a ton of camphor per day. Next year it will make 2 tons per day, or about 600 tons per annum, whereas French consumption is about 2,000 tons per year.

Experts agree that the financial yield from this undertaking is very uncertain, but what is certain is that this society is spending much energy in other fields. It is setting up a plant in Corsica at Prunete-Cervione for preparing extracts of chestnuts, and another plant at Brittany for the making of iodine, using varechs as a basis, without mentioning the fact that it is in correspondence with Griesheim-Elektron for the selling in France of the naphthols from this last plant.

Leucite

A rather interesting industry is that of potassium salts and alumine with leucite as a basis. This is done at the plants of Pierre-Bénite, near Lyons, which is the property of the Société d'Electro-Chimie et d'Electro-Métallurgie, one of the greatest French societies, capital 60 million francs. One of the directors is Mr. Gall, who with Mr. de Montlaur set up in 1886 in Savoy the plants for the electrolytic transformation of chlorides to chlorates.

With respect to the making of alum by using leucite as a basis, we start working the latter after having purified it from its gangue by an electro-magnetic process by sulphuric acid, methodically, and in a way calculated to obtain a solution of concentrated alum, which solution is then crystallised. The concentrated mother-liquors, after adding acid, are used in attacking new parts of the leucite. The remaining silica is dissolved in an apparatus by agitating it in caustic lye at 29° Bé and supplies silicate of soda at 40° Bé. The plant thus treats 4 tons of leucite per day, equal to 6 tons of alum.

Synthetic Phenol

The Compagnie d'Alais, Froges et Camargue, which before the war specialised in mineral industries, was brought, during the war, to the production of synthetic phenol. To do this it has utilised for preparing benzol-sulphonic acid a process which causes the benzol vapours to act on sulphuric acid, which process offers certain technical advantages over the ordinary one. Since then this company has equally busied itself with organic products. It has more particularly set up the preparation of tetrachlorethane by fixing chlorine on acetylene in the presence of iron as a catalyst and the preparation of trichlorethylene, which results in the action of lime on the first chloride.

The trichlorethylene is used more and more in plants extracting fat bodies by replacing the carbon disulphide and benzene, which were used till the present day, but which are both very dangerous. The trichlorethylene is completely fireproof. Moreover, it is not attacked by water. Its only inconvenience is that of being too expensive and slightly anæsthetic. It seems hard (given the actual price of the cubic metre of acetylene, 3 francs, counting the calcium carbide at 100 francs per 100 kilogs.) to reduce materially the price of this product.

Using trichlorethylene as a basis the society in question prepares monochloracetic acid, decomposing it under given conditions by sulphuric acid (Simon process; French patent No. 519,883). The monochloracetic acid thus obtained is particularly pure and suitable for making synthetic indigo. This acid is also made by the direct chlorination of the acetic acid, but the product thus obtained may yield dichloracetic acid, which is troublesome for preparing phenylglycine, an intermediate product for the preparation of indigo.

Using acetylene as a basis, Alais, Froges & Camargue also make synthetic aldehyde. The preparation of the aldehyde, using acetylene as a basis, consists in hydrating this gas by means of diluted sulphuric acid containing mercury salts, which act as catalysts. This reaction gives up almost quantitative yieldings, but its industrial realisation is not a simple problem. Few materials are capable of resisting heated diluted sulphuric acid and metallic mercury which is formed during the operation. What is particularly sought to be avoided is the resinification. Alais, Froges & Camargue avoid the resinification by a continuous circulation of the liquid between the chamber of reaction and another chamber where the aldehyde formed is isolated by vacuum.

The Ethics of Science

LORD BALFOUR, speaking at an East Lothian educational function, stressed the purpose and ideals of true science. In a review of the progress of education, he said, one decided step was the teaching of science, in a practical manner and by actual experiment and demonstration, in our schools. But in the face of this advancement there was a detracting influence in public opinion. There were two truths which some people thought contradictory, but which were, actually, complementary truths. Some thought that science should be pursued for itself alone, and that the great discoveries of science were made possible only by a disinterested desire for truth and understanding, apart from mere personal promotion and financial affluence. That, said Lord Balfour, was true, but it was on that basis of disinterested discovery alone that we could build the technical improvements which were ever necessary for the comfort and well-being of humanity. In itself that reasoning summed up the ethics of true science; but Lord Balfour, always a practical idealist, quickly passed to the essential application of science to industry. Industry, in his mature opinion, must be based in the future upon science; but the two truths would still persist—the search for knowledge and the honest application and the building upon that foundation for the general good. Mankind was, and will be, indebted to science, but it was never realised, and the public's apathy and ignorance are failings that we have had frequently to deplore. If more prominent personages were to impress upon the populace not only the ethics of science but also its part in daily life and happiness, it would do much to strengthen and extend that interest and appreciation which are so essential to the improvement of our industries.

New Soap Works in Kenya

DEVELOPMENTS in soap manufacture are reported from Kenya. A local firm has erected a factory near Nairobi, using a waterfall for power. The soda is imported from England, but local oils are used. An initial production of about a ton a day is expected, with an increase if successful to 3 tons a day. Oil cakes have also been found a profitable product.

Two Germans have recently purchased a factory site in Nairobi from the Government, with the intention of erecting a factory for making soap on a large scale. Common soap to the value of £64,500 was imported into Kenya and Uganda in 1924; of this Zanzibar supplied 47 per cent. and Britain 44 per cent. Toilet soap valued at £21,606 was also imported, principally from Britain and Germany.

A New "Proofing" Process

Practical Possibilities of Secret Product

In The Chemical Age of August 29 reference was made to a new proofing process invented by Mr. E. Cook, of London, and a representative has now had an opportunity of examining textile fabrics and articles proofed by the process.

It is the claim of the inventor that the process renders textile fabrics waterproof by depriving them of their natural affinity for moisture. The applications of such a process are numerous, but it is in connection with textiles that the invention has the greatest possibilities. A wide range of such materials—cotton, artificial silk, and mixtures are all rendered waterproof, and were apparently unaffected in colour, surface, or condition. It is claimed that the colours are also automatically fixed and the fabrics rendered non-shrinkable.

Practical Tests

A piece of ninon, so thin that print could be read through four thicknesses, and of a delicate pale shade, was undistinguishable from the original when proofed. Smoke was easily blown through it from some distance, yet this material held water easily and a small tumblerful was emptied into a "bag" of it. The water could be rolled about in the "bag," but when the quantity was doubled, owing to the pressure, the ninon began to leak, and by touching the parts holding water, this escape was increased. The ninon was apparently unimpaired and felt perfectly dry. Georgette was turned under water, but absorbed no apparent moisture and was unaffected. Similarly velvets, mohair, etc., were shown to throw off water and resist moisture much as would a greasy cloth. Proofed paper, wallpaper, and leather were also shown, and a practical test was offered by a piece of white blotting paper, one half of which had been proofed. To the lay eye there was nothing to indicate which portion had been treated. The water ran rapidly off one half, but was instantly absorbed by the other portion in the normal way.

Treatment of Metals

A claim for the process is that the proofing permeates the whole product, and that each integral part is completely proofed; but the inventor also claims that a superficial protection can be applied to small metal articles. Needles, cutlery, etc., can be treated without being taken out of the packets, and they are so affected as to remain impervious to moisture, and thus rustless, in stock or in transit. The surface protection wears off with use or friction, but it is claimed that by this process such articles can be delivered in perfect condition, whereas at present rust causes considerable losses. Not only are the steel goods proofed, but the wrappings and containers are also rendered waterproof. Tarnishing of metals and the metallic element in brocades, etc., is also eliminated.

A further field is the treatment of powders which, Mr. Cook claims, can be deprived of their deliquescent properties. This is of particular interest to the printing trade, because in lithographic work deliquescent pigments frequently result in the "bleeding" of colours which prevents efficient printing.

General Properties

The general properties claimed for this "Bonanova," process are that it is invisible, insoluble, inexpensive, odourless colourless, and harmless. The condition provided is permanent, except in the case of metals, when the effects are purely superficial. Other directions in which the invention would appear to have considerable possibilities are in the paper, wood, leather, and similar industries.

The process is a secret one and is not to be patented.

Recent Chemical Tenders

Recent tenders accepted include:—Air heater for multitubular boilers at Chicama Sugar Factory, Peru; Howden-Ljungstrom Preheaters (Lond.), Ltd., Glasgow; Sewage lifting plant for Derby and Singapore, D. Adamson and Co., Dukinfield; centrifugal pumps for Liverpool Corporation, Rees Roturbo Manufacturing Co., Wolverhampton; artificial silk factory equipment for the Rayon Manufacturing Co., Kohorn and Co., Chemnitz and Vienna; rock asphalt and bitumen, Penmaenmawr and Trinidad Lake Asphalte Co., Ltd., Liverpool; portland cement, Warren Cement Works, Hartlepool, both for Manchester Corporation.

British Glues and Chemicals

Successful Research Policy

Speaking at the ordinary general meeting of British Glues and Chemicals, Ltd., in London, on Wednesday, Mr. T. Walton, chairman, said that the sphere of the company's activities was widening, and their products were becoming increasingly well known and highly regarded both at home and abroad. Generally speaking, the Continental manufacturer still had the advantage of lower labour costs, but, despite competition, they had well held their own and their stocks were again reduced. They continued to prosecute research work with unabated vigour, and were obtaining valuable benefits from cordial co-operation between works and laboratory, and working costs, as the result of close control and stimulation of healthy rivalry between branch and branch, showed a pleasing improvement.

Manufacturing and trading conditions continued to be difficult, and, though they had experienced an improvement, profit being slightly greater than in any year since the boom, it would be wrong, having regard to the fact that we are so dependent upon the general trading conditions of the country, to conclude that the company had quite "won through." He felt that even now our nation had not sufficiently realised that the price to be paid for national recovery was sustained intelligent effort. In this connection he regretted that whilst much prominence was given in the Press to the views of economists and financiers on matters which were undoubtedly of great importance, the imperative necessity for individual and collective effort—and not only of manual workers—was not sufficiently often and with adequate force hammered home by the leaders of our Government as the spokesmen of the nation.

Immediate Outlook

He was not, for reasons explained, optimistic in regard to the early future, but it was certain they had made very real progress in consolidating their position, and though patience on the part of the proprietors would for some time be necessary, he was confident that they would ultimately achieve success.

Preservatives in Food

Scientific Inquiry Urged by Professor Armstrong

In a letter to *The Times* on Thursday, an entire suspension of judgment on the question of preservatives in food was advocated by Professor Armstrong until an adequate inquiry has been held. He writes:—"It is useless to make assertions. Digestion, in its earlier stage, is known to be an acid process; in its later, the acid is all but, if not entirely, neutralised by a natural change. The possible 'preservatives' are weak acids. Some few sensitive individuals may be affected by them—I have friends who assert they are. On the other hand, I know of people who cannot tolerate any form of shell fish, and some to whom even eggs are poison. The masses at large have long eaten food containing preservatives and continue to digest; the public health was never better, on the average. What we need is facts. I have made many more experiments, and what I am now in search of is proof that boric acid can act harmfully, rather than that it is harmless. The proper attitude to adopt is that of entire suspension of judgment, until a full scientific inquiry has been made. The economic issues at stake are so great that this must be undertaken and without delay."

U.S. Colour Imports Increasing

An official analysis of U.S. dye imports during the past seven months indicates a steady increase in colours. The July imports amounted to 675,843 lb. compared with 143,680 lb. in July, 1924. The largest imports in any one month during 1924 were in March, when the total was 302,799 lb. Since January, 1925, the imports each month have exceeded the March, 1924, imports, and during some months they have totalled more than 400,000 lb. In March, 1925, they were 527,964 lb. Imports of synthetic aromatic chemicals were down in July, as also were colour lakes. Intermediates, etc., were valued at $64,074 in July as compared with $28,043 in June.

From Week to Week

THE USE OF CHEAPER DYES is to result in a new colour scheme for French postage stamps.

NEWTON, CHAMBERS AND CO., LTD., are removing on September 21 from 331 to 311, Gray's Inn Road, London, W.C.1.

THE WEDDING TOOK PLACE in the chapel of King's College, Old Aberdeen, of Mr. W. H. Bruford, of Aberdeen University, to Miss Gerda H. Hendrick, .daughter of Professor Hendrick, F.I.C., of Aberdeen.

A DEBTOR at Bradford Bankruptcy Court, on Monday, said that in his capacity as painter he painted certain stations and railings between Southport and Preston. Four prize cattle licked some of the paint and died, and debtor was ordered to pay £236 and costs at the Manchester Assizes.

AN ALLEGED NUISANCE at the works of Craven and Co., The Leys, has been investigated by Evesham Town Council. Two products, a lime and sulphur mixture and "behemnite," are manufactured, but the county analyst stated that every possible precaution would be taken to eliminate the dust complained of, and the Council decided to take no further action.

A PROMINENT DUTCH ARTIFICIAL SILK FIRM, Enka, has raised £1,000,000 to acquire property and build mills in this country. In Germany there is a belief that the recent fusion between Courtaulds, Ltd., and German artificial silk manufacturers will be followed by a general co-operation between the Snia Viscosa of Milan, the Eberfelder-Bemberg, Eberfelder and Barmen, and Courtaulds, Ltd.

A PARTIAL CLOSING of the oil shale mines of Scottish Oils, Ltd., Uphall, is announced, to take effect as from September 15. It is anticipated that over 1,700 workers will be affected, and the remainder are to be asked to accept reductions in wages. The value of a ton of shale to-day is 12s. 3d., against 25s. in 1920. The men are to resist the wage reductions, and the general council of the British Trades Union Congress are to be informed with a view to approaching the Government.

A NEW PRODUCT has been produced by the Du Pont company of New York under the name of "Sitol." It is used in small quantities in the kier boiling liquor to prevent bleeding of vat colours into the adjacent white, in the bleaching of white goods containing coloured effects dyed with vat colours of the anthraquinone series. Sitol can also be used to great advantage as an addition to resistant pastes to be used under vat dyeing, as it materially improves the resistant effect.

THE REPORT, under the Boiler Explosions Acts, of the explosion, on May 6, at the works of the Chemical Supply Co., Ltd., Barking, Essex, has now been published. A workman was slightly burned by the carbolic acid when the steam jacketed pan exploded. The cause of the explosion was the steam pressure between the inner and outer vessels exceeding that which the inner vessel was capable of withstanding. No pressure gauge, safety valve, or other means for limiting or ascertaining the pressure was provided. Suitable safety devices were fitted on other pans in the factory.

RESEARCH FELLOWSHIPS AND ADVANCED SCHOLARSHIPS are to be offered by the Council of the British Research Association for the Woollen and Worsted Industries next year. Each fellowship, of not more than £200 in value, will be granted for one year, but may be renewed for a second year. They may be held in an institution, but persons in factories are not excluded. Any results obtained are reserved for the Association, which will decide whether they can be made public. Notices with regard to the fellowships will be published during June and July, and sent to the universities and technical institutions. The advanced scholarships will be of sufficient value to maintain the student and cover expenses and books.

THE BIRMINGHAM AND MIDLAND ALLIED TRADES EXHIBITION was opened at Birmingham last week. The Birmingham Chamber of Commerce is responsible for the exhibition, which will remain open until September 19. Enamels, paints, and varnishes are shown by Merrick and Heath, of Smethwick, Thomas Howse, Ltd., of Smethwick, Naylor Brothers (London), Ltd., Carrs (Birmingham), Ltd., of Birmingham, Thomas Parsons and Sons, of Oxford Street, London; and the Walpamur Co., Ltd., of Birmingham. Allen-Liversidge, Ltd., of Westminster, have an exhibit dealing with oxy-acetylene lead burning, for which great economies are claimed; the de Vilbiss Co., Ltd., of West Drayton, feature spraying equipment for applying paint, distemper, varnish, or thin tar by compressed air; the "Easilit" Blow Lamp Co., King's Norton, display a gloss varnish; and bituminous solutions and wood preservatives are shown on the stand of W. H. Keys, Ltd., of West Bromwich. Textural finishes for stucco work are sent by Goodman and Co., of Selly Oak, Birmingham, as well as metallic oxides for colouring cement; specialities for undercoating by Roberts, Glazebrook and Co., of Tyseley, Birmingham; a variety of white and other leads by Locke, Blackett and Co., Ltd., of Newcastle; "Decco Turps" by Glico Petroleum, Ltd., of Queen's Square, London; and waterproofing paints and compounds and wood preservatives by the Cuirass Products Co., Ltd., of Westminster, London.

THE FIRST BEET SUGAR FACTORY in the Irish Free State is to be established at Carlow by the Belgian firm of Lippens.

A NEW BEET SUGAR FACTORY is to be built in conjunction with the refinery of the Sankey Sugar Co., to serve Lancashire and Cheshire.

THE TRADE COMMISSIONER to Western Canada announces the removal of his offices from 210, Winch Building to 18, Commerce Building, Vancouver, B.C. (Telephone: Seymour 9152.)

SULPHUR IN JARS IGNITED on the premises of Zamer, waterproof manufacturers, of Pendleton, on Friday, September 4. The damage was not extensive, although the fumes hindered operations.

AN EIGHTY-TON BARGE, *Le Roi Albert*, laden with sulphur, lying off Nicholson's Wharf, on the Thames, caught fire on Tuesday. Smoke helmets had to be used by the firemen and it was found necessary to sink the barge.

MR. ALEXANDER RULE was found dead on Tuesday at Dingwall Gasworks. He was manager of the works and as the holders were empty it is thought that he was overcome while trying to stop an escape of gas.

THE PHŒNIX CHEMICAL WORKS, Church, near Accrington, will be sold by auction on Wednesday, September 16, together with plant and machinery for the manufacture of tartaric acid and cream of tartar. Catalogues may be obtained from E. Rushton, Son and Kenyon, 13, Norfolk Street, Manchester.

A MARRIAGE HAS BEEN ARRANGED, and will take place early next year, between Anthony, elder son of Mr. and Mrs. Roscoe Brunner, of Belmont Hall, Northwich, Cheshire, and Cecilia Ethel, elder daughter of the late Mr. R. A. d'A. Willis, of Halsnead Park, Prescot, Lancashire, and of the Hon. Mrs. Willis, of Myton Grange, Warwick.

MEMBERS OF THE COMMISSION to inquire into the coal industry are Sir Herbert Samuel, chairman, Sir William Beveridge, Sir Alexander Lawrence and Mr. Kenneth Lee (chairman of the British Cotton Research Association). Four expert advisers to the commission include Dr. C. H. Lander, Director of Fuel Research in the Department of Scientific and Industrial Research.

SPEAKING OF DERMATITIS at the Confectioners' and Bakers' Exhibition in London, Mr. W. Collier, president of the National Association of Master Bakers, said that 75 per cent. of the general public suffered from it, and bakers suffered no more. The disease had always existed, and in the present day bakers were required to notify outbreaks. There was no need for uneasiness on the part of the public. (The chemicals used for bleaching the flour are generally declared to be the cause of dermatitis.)

THE INTERNATIONAL COMBUSTION, LTD., of Africa House, Kingsway, London, W.C.2, announce that owing to expansion of the business handled by its Commercial Pulverising Department, this section has now been transferred to separate offices, at 11, Southampton Row, London, W.C.2. (Telephone: Museum 2867.) An arrangement has been entered into and completed with the Hardinge Co. whereby the International Combustion, Ltd., will now be in a position to offer clients alternatively mills of the well-known Hardinge or Raymond Type, together with the wider range of manufactures consisting of screens, air separating plant, lime-hydrating plants, automatic pulverising units, etc., all of which products will be manufactured in this country. Mr. J. C. Farrant has been appointed general manager of this department, and Mr. C. S. Messenger, sales manager.

AT THE FORTHCOMING Shipping, Engineering and Machinery Exhibition at Olympia, London, November 23 to December 5, Negretti and Zambra, of 38, Holborn Viaduct, London, will exhibit indicating and recording instruments of all kinds for temperature, pressure, draught and humidity for land and marine use; distance thermometers with compensated capillary tubing and direct action movement; distance thermometers, electrical type with variable resistances for altering length of connecting wires; distance tank gauges indicating and recording: dial type with pointer; locomotive pyrometer for superheaters; automatic temperature control apparatus for cold stores, vats, steam heated tanks, ovens, etc.; dial and tilted draught gauges for low pressures; hair hygrometers indicating and recording, also electric alarm models.

Obituary

MR. THOMAS STEEL, F.C.S., at Sydney, N.S.W., retired analytical chemist, formerly with the Colonial Sugar Refining Co., Greenock.

PROFESSOR CHARLES CHANDLER, formerly professor of chemistry at Columbia University, and an original member of the Society of Chemical Industry.

COLONEL FRANK WALKER, who with his two brothers, founded the firm of W. and F. Walker, Ltd., of Liverpool, oil merchants and disinfectant manufacturers. Since the death of his brothers he had been chairman of the firm. He died suddenly at his residence at Heswall.

MR. HAROLD R. CATTLEY, of Hull, aged 67, on Saturday, September 5. He was a prominent commercial man, and head of Cattley, Campbell and Co., seed and oil merchants. He retired in 1914, but did much public work in connection with hospitals, church, and politics. He was a city magistrate for many years.

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Abstracts of Complete Specifications

237,937. Recovery and Concentration of Nitric Acid. Nobel's Explosives Co., Ltd., and J. W. McDavid, Ardeer Factory, Stevenston, Ayrshire, Scotland, and E. Williams, High View, West Heath Road, Abbey Wood, London, S.E. Application date, February 11, 1924.

The process is for recovering and concentrating nitric acid from waste nitration acids resulting from the nitration of glycerine and toluene. This acid usually contains about 76 per cent. sulphuric acid, 8 per cent. nitric acid, 2–3 per cent. organic matter, and 14 per cent. water. In the usual recovery process, nitric acid and some oxides of nitrogen are evolved by treating the steam, and are condensed in absorption towers in the form of weak nitric acid, which is then concentrated by mixing with concentrated sulphuric acid and treating with steam in a retort. In the present process, the object is to obtain concentrated nitric acid without the employment of special distillation retorts.

It has been found if weak nitric acid is added to the nitration waste acid in certain proportions, the mixture can be treated in the usual denitrating tower yielding vapour of strong acid which can be condensed. The acid is treated with steam in a denitrating tower, so that sulphuric acid escapes at the bottom. The vapour of nitric acid and oxides of nitrogen are conveyed to a series of oxidation and absorption towers to obtain dilute nitric acid. This acid is returned to the waste acid tank, and the mixture with the waste acid is returned to the denitrating tower. The strong acid vapour liberated in the tower is recovered in a condenser which is inserted between the denitration tower and the absorption apparatus. The effluent acid varies in strength according to the amount of weak nitric acid introduced, and also according to the temperature at which the mixture of weak acid and waste acid is fed into the tower. If the acid is warm, the quantity of steam necessary is less, so that the effluent is less diluted. The quantity of the weak nitric acid added is chosen according to the strength of the sulphuric acid required in the effluent. The acid may be employed again in the nitration of glycerine after concentration. The sulphuric acid recovered is stronger if the mixture of weak nitric acid and waste nitric acid is preheated. Instead of preheating, the denitration may be effected by the use of superheated steam, or a small proportion of strong sulphuric acid may be added to the mixture of weak nitric acid and waste nitric acid. Charring of the effluent sulphuric acid on concentration can be avoided by adding a small quantity of nitric acid during concentration. The process is applicable to all waste nitration acids containing a comparatively small amount of nitric acid, and a relatively large amount of organic matter.

237,943. Dyeing or Colouring or Products or Articles made with Cellulose Acetate. British Celanese, Ltd., 8, Waterloo Place, London, S.W.1, and G. H. Ellis of British Celanese, Ltd., Spondon, near Derby. Application date, April 4, 1924.

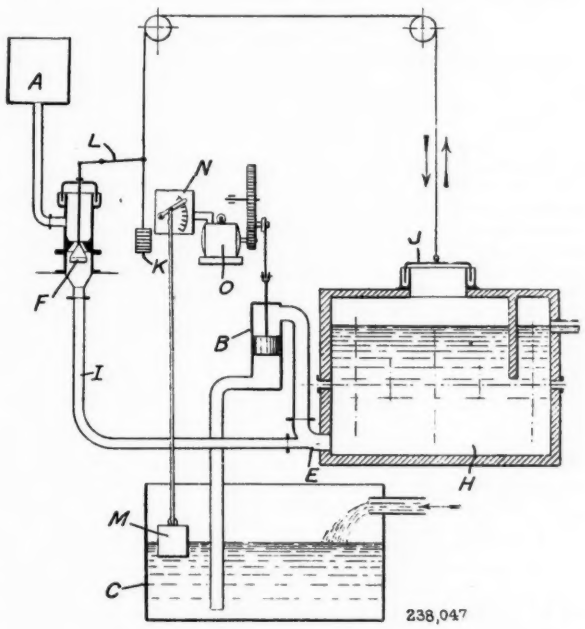
Specifications No. 219,349 and 224,925 (see The Chemical Age, Vol. XI, pp. 221 and 667) describe the dyeing and printing of cellulose acetate materials by colouring matters which have an affinity for the acetate, but which are practically insoluble in water. This is effected by treating them with solubilising agents such as sulpho-ricinoleic, or other sulphated fatty acids, *i.e.*, higher fatty acids or sulphonated or other derivatives containing salt-forming groups or salts of such acids; also carbo-cyclic compounds containing in their structure one or more salt forming groups such as naphthenic acids or other carboxylic or sulphonic acids of the cyclo paraffins, phenols, sulphonic acids, carboxylic acids, phenol sulphonic acids, or other derivatives of the benzene, naphthalene, and anthracene series, or other derivatives of the saturated or non-saturated hydrocarbons, containing one or more salt-forming groups. It has now been found that unsulphonated nitro-derivatives of diarylamines which may or may not contain substituent groups such as OH, NH_2, or Cl, can be employed in the form of solubilised modifications by treating with the above mentioned solubilising agents. Examples are given of the use of 2:4-dinitro-4′-hydroxydiphenylamine, 2:4-dinitro-4′-dimethylamino-diphenylamine, 2-nitro-4-chlor-diphenylamine, 4-chlor-2-nitro-4′-amino-diphenylamine, 4-chlor-2-nitro-4′-hydroxy-diphenylamine, 4:4′-dinitrodiphenylamine, 4:2′-dinitrodiphenylamine, etc. These derivatives usually have little effect on cotton, silk, or wool.

238,033. Oxidation of Alcohols and Aldehydes. E. B. Maxted, and B. E. Coke, Manor Road, Penn, Wolverhampton. Application date, June 4, 1924.

Specification No. 228,771 (see The Chemical Age, Vol. XII, p. 256) describes the oxidation of hydrocarbons by passing the vapour mixed with air over a catalyst containing a vanadate of tin or bismuth. In this invention, alcohols and aldehydes can be oxidised in a similar manner. When an alcohol is treated, the product usually consists of or contains the corresponding carboxylic acid, and/or aldehyde or ketone. The oxidation of an aldehyde yields the corresponding carboxylic acid. Tin vanadate obtained by the interaction of ammonium vanadate and stannic chloride is the preferred catalyst, but bismuth, cobalt, and lead vanadates may also be used. By this process benzyl alcohol or benzaldehyde are oxidised to benzoic acid, and ethyl alcohol to a mixture of acetic acid and acetaldehyde.

238,047. Continuous Chlorination of Cellulosic Materials by Means of Chlorine Solutions, Process and Apparatus for. A. R. de Vains, 10, Rue Henri Grobon, Miribel, Ain, France. Application date, June 28, 1924.

The illustration shows an automatic plant for the continuous treatment of cellulosic materials by a solution of chlor-



ine. The cellulosic material in the form of pulp is contained in a tank C, and is delivered by a pump B through an inlet E to a chlorination vessel H. Chlorine solution is also supplied from a reservoir A through a pipe I containing a valve F. If an excess of chlorine solution is supplied to the vessel H, the increase of pressure due to liberation of chlorine acts on a bell seal J connected to a lever L which controls the valve F to decrease the supply of chlorine solution. The tank C is provided with a float M connected to the switch N of the motor O which actuates the pump B. When the level of pulp rises, the speed of the motor O is increased so that more pulp is delivered to the vessel H.

Chlorine dissolves in water to an extent inversely proportional to the temperature of the water, so that if the tempera-

ture is raised, some chlorine is liberated. The chlorination of ligno and pectocellulose liberates about 49 calories per gram atom of chlorine fixed on the hydrogen nearest to the active CO group contained in the molecule. It follows, therefore, that the temperature of the reaction mixture increases in direct proportion to the quantity of chlorine absorbed by the cellulose. If the active CO groups are saturated with chlorine, chlorine will be liberated from the solution which is continuously fed to the vessel H. This chlorine creates an increase of pressure which is employed to control the delivery of chlorine solution. The degree of chlorination of the cellulosic material is thus only a function of the quantity of chlorine fed to the reaction vessel, and of the capacity of the latter. The supply of cellulosic material may, therefore, be varied as desired while still obtaining a uniform chlorination.

238,072. Utilising Vitriolic Sludges Obtained from the Refining of Hydrocarbons. M. B. Trepel, 10, Rue Sainte Anne, Paris. Application date, July 30, 1924.

The object is to utilise the sludge obtained in the treatment of the derivatives of crude petroleum, kerosene, white spirit, mineral oil, etc., with sulphuric acid. The sludge is neutralised with sodium carbonate, calcium oxide, carbonate, or sulphide, or barium carbonate, by gradually adding the sludge to one of the above compounds in the form of powder. The mixture remains in the form of powder, and no sulphurous gas is liberated, so that there is no loss of sulphuric acid. The process is also applicable to vitriolic sludge which has previously been treated with hot water or steam, or by heating to remove part of the sulphuric acid. The sludge, after treatment with sodium carbonate, is heated to 700°-1100° C. out of contact with air yielding sodium sulphide. The reduction of the sulphate into sulphide is effected by the organic material in the sludge until the carbon has completely disappeared. The sludge may alternatively be neutralised by means of sulphides obtained in this process, particularly calcium sulphide. In this case sulphuretted hydrogen is liberated, which may be used for the preparation of sulphur. This may be done by heating the sludge to liberate sulphur dioxide, which is then caused to react with the sulphuretted hydrogen. The partly desulphurised sludge may then be neutralised as above. The transformation of the sludge into sulphides may be facilitated by adding, after neutralisation, carbon in the form of coal, coke, charcoal, sawdust, breeze, organic residues, etc. The neutralised sludge may be heated in two stages, the first to 400° C. to liberate condensible vapours and gases which are collected. The residue, consisting of sulphate and carbon from the cracking of the oil and asphalte, is then heated to redness to obtain sulphides.

238,166. Separating Gas Mixtures More Particularly Air and other Difficultly Liquefiable Gases. R. F. Mewes and R. K. E. Mewes, 8, Pritzwalkerstrasse, Berlin, N.W.21. Application date, February 4, 1924.

In the separation of air by liquefaction, the nitrogen which issues at the upper end of the separating column and which is at the pressure in the column is subjected to repeated condensation in a condenser in successive stages. The condensate is collected at a number of points and returned from one or more of these to the column. The gaseous or liquid nitrogen obtained in the last stage is withdrawn. Oxygen which collects at the bottom is subjected to repeated vaporisation in successive stages, and the liquid oxygen is withdrawn from the last stage and used, after expansion, as cooling medium in the condenser for the nitrogen.

Note.—Abstracts of the following specifications, which are now accepted, appeared in The Chemical Age when they became open to inspection under the International Convention:—215,783 (Farbenfabriken vorm. F. Bayer and Co.), relating to a process for dyeing acetate silk, see Vol. XI, p. 71; 227,125 (O. Scarpa), relating to the electrolytic extraction of tin contained in bronzes and recovery of copper at the same time, see Vol. XII, p. 31 (Metallurgical Section); 230,447 (H. Suida), relating to the recovery of concentrated acetic acid from dilute acetic acid, see Vol. XII, p. 507; 234,434 (P. J. Martin and G. F. Bertels), relating to decarbonisation of cast iron or other metals, see Vol. XIII, p. 15 (Metallurgical Section).

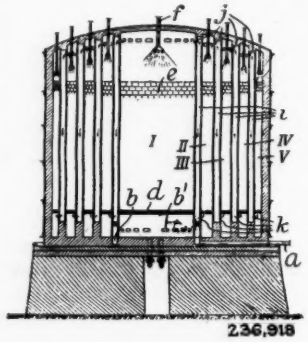
International Specifications not yet Accepted

236,891. Polymerised Styrolene and its Homologues. Naugatuck Chemical Co., Elm Street, Naugatuck, Conn., U.S.A. Assignees of L. Ostromislensky, 561, West 58th Street, New York. International Convention date, July 12, 1924.

Styrolene and its homologues are polymerised by heating, to obtain three series of compounds, termed α-, β-, and λ-metastyrolenes. To obtain the α-compounds, styrolenes above 92 per cent. purity are heated to 140° C. for 20 hours, or 175° C. for 5 hours, or intermediately. These products are tough, transparent, and colourless. Cracking is prevented by subsequent heating to 100° C. for 3-24 hours. 2:4-dimethyl and 4-methyl styrolenes yield products which are elastic and may be hardened by heating. If the styrolenes are heated to higher temperatures for longer periods, the β-compounds are obtained. These are at first transparent, but become opaque and are more brittle. To obtain the λ-compounds, styrolene is heated with an organic peroxide such as benzoyl peroxide or triphenyl methyl peroxide. Several reagents which accelerate or retard polymerisation may be used.

236,918. Absorbing Gases. Chemische Werke Lothringen Ges., Gerthe, Westphalia, Germany. International Convention date, July 10, 1924.

A gas scrubber for absorbing nitrous gases obtained in the manufacture of nitric acid comprises a series of packed annu-



236,918

lar towers one within the other. The gas is admitted through a pipe *a* to a circular conduit *b* having openings b^1 into the inner tower I, and passes upwards through perforated plates *d* and packing material *e*. Absorbing liquid is supplied by sprayers *f*. The gas passes from each tower through apertures *j* into annular passages *i*, and so into the next tower through apertures *k* at the bottom.

Latest Notifications.

239,169. Process for refining mineral oils. Akt.-Ges. für Chemiewerte. August 27, 1924.

239,173. Vulcanisation of caoutchouc. Chemische Fabrik Kalk Ges., and Oehme, H. August 27, 1924.

239,178. Process for producing fatty acids from hydrocarbons. Pataky, W. C. H., and Nellensteijn, F. J. August 27, 1924.

239,222. Electrical heating-body for high temperatures, particularly for ceramic, metallurgical, and chemical processes. Studienges für Wirtschaft und Industrie. August 28, 1924.

Specifications Accepted with Date of Application

222,094. Vat dyestuffs containing sulphur, Manufacture of. Farbwerke vorm. Meister, Lucius, and Brüning. September 17, 1923.

224,252. Purification and decolorisation of oils and fats, Process for. J. Duclaux. November 2, 1923.

226,500. Carbon monoxide and hydrogen, Process and apparatus for the manufacture of. K. Michalski. December 17, 1923.

229,694. Carbonising and distillation plant for wood and the like. E. D. Deperrois. February 20, 1924.

231,802. Cellulose combinations, Process for making. L. Lilienfeld. April 4, 1924.

238,582. Furnace for reducing ores. R. E. Ellis. (*R. L. Gamlen.*) March 15, 1924.

238,590. Dyeing processes. R. F. Thomson, J. Thomas, and Scottish Dyes, Ltd. April 24, 1924.

238,621. Oxides of sulphur, Production of. C. S. Robinson. May 23, 1924.

238,663. Extraction of metals from their compounds. A. S. Cachemaille. (*Westinghouse Lamp Co.*) July 7, 1924.
238,676. Diazo compounds, Manufacture and production of. J. Y. Johnson. (*Badische Anilin und Soda Fabrik.*) July 21, 1924.
238,683. Sulphaminoazo bodies, Preparation of—and of diazo azo compounds therefrom. W. Carpmael. (*Farbenfabriken vorm. F. Bayer and Co.*) July 28, 1924.
238,704. Diazo compounds, Manufacture of. O. Y. Imray. (*Soc. of Chemical Industry in Basle.*) August 26, 1924.
238,717. Anthraquinone dyestuff, Manufacture of. British Dyestuffs Corporation, Ltd., W. H. Perkin, and A. W. Fyfe. September 17, 1924.
238,721. Dyeing fabrics containing acetyl silk. British Dyestuffs Corporation, Ltd., and H. D. Mudford. September 19, 1924.
238,723. Distillation of carbonaceous material, Method and apparatus for. E. C. R. Marks. (*Catlin Shale Products Co.*) September 22, 1924.
238,737. New azo dyestuffs, Manufacture of. W. Carpmael. (*Farbenfabriken vorm. F. Bayer and Co.*) October 16, 1924.
238,805. Catalytic metals contaminated by sulphur. Process for the regeneration of. E. A. Prudholme. May 23, 1924.
238,825. Acetic anhydride and aldehyde, Process of manufacture of. Soc. Chimique des Usines du Rhône. October 13, 1924.

Applications for Patents

Austerweil, G. Preparation of menthol from p-cymene. 22,047. September 3. (Germany, August 21, 1923.)
Cassella and Co., Ges., L., and Ransford, A. J. Production of arsenic compounds of the aromatic series. 21,969. September 2.
Chadburn, W. R., and Chadburn Co., Ltd., De Laval. Purification of oils. 21,887. September 1.
Classen, A. Manufacture of cellulose-containing solutions. 22,072. September 3.
Coley, H. E. Production of iron from ores. 21,909. September 2.
Compagnie Nationale de Matières Colorantes et Manufactures de Produits Chimiques du Nord Réunies Etablissements Kuhlmann. Manufacture of glue, etc., discs, etc. 22,117. September 4. (France, September 4, 1924.)
Green, R. Manufacture of cellulose acetate. 21,856. September 1.
Hammond, C. F., and Shackleton, W. Concentration or purification of caustic soda, etc. 22,252. September 5.
Holliday and Co., Ltd., L. B., and Shaw, C. Manufacture of black dyestuffs. 21,733. August 31.
Long, C. L., and MacNaughtan, D. J., Electrodeposition of chromium. 22,165. September 4.
Millberg, C. Preparation of phosphoric acid. 21,939. September 2. (France, September 18, 1924.)
Naugatuck Chemical Co. Manufacture of rubber-containing mixtures, etc. 21,952. September 2. (United States, September 15, 1924.)
Nobel's Explosives Co., Ltd. Manufacture of artificial leather, etc. 22,020. September 3.

U.S. Methanol Production Increasing

In view of the anticipated menace to the U.S. wood alcohol industry by reason of the German production of the synthetic product at less than half the price, it is interesting to note that the June production of methanol amounted to 552,365 gallons as compared with 492,902 gallons produced in the same month of last year. Shipments of methanol in June of this year amounted to 532,835 gallons as compared with 472,285 in the same month of last year, while stocks on hand at the end of June this year totalled 1,729,206 gallons as compared with 2,368,760 gallons in the same month of last year. Acetate of lime production in June of this year amounted to 10,821,839 pounds, while shipments for the month amounted to 12,735,014 pounds and stocks on hand at the end of the month totalled 16,453,025 pounds. Wood consumption for June in the wood chemical plants amounted to 59,538 cords, while stocks on hand at the end of the month amounted to 537,246 cords.

Import figures into the United States show that for the entire year of 1924 only 48 gallons were imported, valued at $29. In January of this year 40 gallons, valued at $26, were imported, in February, 62,971 gallons, valued at $29,420. The figures for March, April, May, and June are preliminary and cover four principal Atlantic Coast Customs Districts. In March, imports amounted to 69,886 gallons valued at $26,976; in April, 9,012 gallons valued at $5,201; in May, 115,120 gallons, valued at $52,917, and in June, 61,046 gallons, valued at $26,504.

Cement Industry Developments

Rapid Reconstruction at Northfleet

In consequence of continued activity in the cement trade, great importance is attached by the Associated Portland Cement Manufacturers to the early completion of their reconstruction scheme at Bevans Works, Northfleet. More than 500 men are engaged continuously on day and night shifts, and the directors hope to reopen the works in the early spring. In order to facilitate the transport of heavy plant and machinery, one of the earliest pieces of work carried out by the engineers was the construction of a strong, inclined railway. This leads from the old Telpher dock, and has already carried up one of the new rotary kilns, which will be the largest in the world.

New Plant

The constructive part of the work completed up to the middle of August included the erection of the new washmills and two clay mixers and the laying of a slurry main—about a mile in length—from the washmills to the mixers. Work is proceeding rapidly on the rotary foundation, the cement storage silos, and the new grinding mills. Sixty men are engaged night and day on the grinding mills. Every possible device for speeding up the work appears to have been adopted, and with this object Ferrocrete, the rapid hardening cement, is being used for more than 60 per cent. of the new buildings. Work on the new concrete jetty, which will be 600 feet long and have a spring-tide low water depth of 26 feet, is still in the very early stages, but preparations have been made to manufacture the concrete piles on which the jetty will be built. These piles will be 60 feet long and 18 inches square, reinforced, and made of Ferrocrete cement.

Bevans, when completed, will be one of the most up-to-date cement works in the world, and its output of 10,000 tons a week will exceed that of any other works in Europe.

Quarrying at 150 Tons an Hour

Clay will be broken down at the pits in Swanscombe Woods, and pumped through 1½ miles of pipes to storage, whence it will be conveyed by gravitation into washmills. These are situated near a great hill of chalk—now under cultivation—which will be quarried by a steam navvy at the rate of 150 tons an hour. By means of special lifts the wagons conveying the chalk can be raised bodily and tipped over the top of the washmills, flints being removed from the bottom of the mills direct into other wagons. During its passage through the washmills, the slurry will be reduced to a fineness so that the residue on a 180 mesh sieve (which is equivalent to 32,400 holes to the square inch) will be not more than 3 per cent. It will then be pumped through 8-inch steel pipes to six storage mixers. These are each 66 feet in diameter and 11 feet deep—having a capacity for sufficient slurry to produce 500 tons of clinker. The rotary kilns which will be fed with this slurry in absolute regular quantities are of a modern pattern, each capable of producing 360 tons of cement clinker a day. Each will be 250 feet long, and the capacity of the four will be double that of the twelve old kilns which have been scrapped. After passing through coolers, the clinker will be conveyed to storage and subsequently ground. The six grinding mills which are being built are of the compound pattern, and each will be capable of producing twelve tons an hour—the cement giving a residue of not more than 5 per cent. on the 180 sieve.

From these mills the cement will be driven into storage silos by means of compressed air, and conveyed thence to the packing plant for shipment in casks or sacks. Electric luffing cranes will be used for this purpose.

Wood Preservation Research

The Forest Products Laboratories of Canada are carrying on extensive research into the chemical preservation of timber. The yearly loss due to decayed wood is estimated at not less than 35,000,000 dollars. There are now ten wood treating plants in Canada and three more under construction. In response to frequent inquiries as to the suitability of Canadian woods for treatment, the laboratories have selected twenty Canadian woods and are now investigating the relative suitability of these woods for treatment. Among other problems that are engaging attention are the seasoning of hardwood ties for creosote treatment, the value of certain proprietary wood preservatives, and the use of crude oil in mixture with preservatives for the treatment of railway ties.

London Chemical Market

The following notes on the London Chemical Market are specially supplied to THE CHEMICAL AGE *by Messrs. R. W. Greeff & Co., Ltd., and Messrs. Chas. Page & Co., Ltd., and may be accepted as representing these firms' independent and impartial opinions.*

London, September 11, 1925.

THE market during the past week has been quietly steady and without special feature.

There has been a fair export inquiry but business actually concluded is below the average.

General Chemicals

ACETONE remains unchanged at £75 to £76 per ton, ex wharf London.

ACETIC ACID is in steady demand, technical is quoted at £37 to £38 per ton and pure £38 10s. to £39 per ton for 80% grades.

ACID CITRIC is lifeless.

ACID FORMIC is rather quiet, price £48 per ton for 85% technical.

ACID LACTIC is unchanged.

ACID OXALIC.—The market has been somewhat disturbed by realisations of weak holders. The underlying tendency remains firm. Price 3¾d. per lb.

ACID TARTARIC is quiet at 11¼d. per lb.

ALUMINA SULPHATE.—There has been some little inquiry, but prices are still declining. The nominal figure to-day is about £6 2s. 6d. per ton.

ARSENIC is unchanged.

BARIUM CHLORIDE is in good demand at £9 per ton.

CREAM OF TARTAR is firmer in consequence of the improvement in the Italian exchange. It seems likely to go higher.

EPSOM SALTS is unchanged at about £5 per ton, ex wharf.

FORMALDEHYDE is much firmer. Makers are working at a loss and are seeking a way out of the unsatisfactory situation.

LEAD ACETATE is unchanged at £45 per ton for white and £40 per ton for brown.

LIME ACETATE.—Very little business is passing, grey being firmly held at £15 10s. per ton for 80%.

CAUSTIC POTASH is unchanged.

POTASSIUM CHLORATE is very firm at 4¼d. to 4⅜d. per lb.

POTASSIUM PERMANGANATE is unchanged.

POTASSIUM PRUSSIATE is very quiet. Price 7½d. per lb.

SODIUM ACETATE is rather quiet and is quoted at £18 per ton, ex wharf.

SODIUM BICHROMATE.—A fair business is passing at about English makers' figures.

SODIUM HYPOSULPHITE is unchanged.

SODIUM PRUSSIATE.—Quietly steady at 4⅜d. per lb.

SODIUM NITRITE has been in good demand at £22 10s. per ton.

SODIUM SULPHIDE is unchanged.

ZINC SULPHATE is unchanged.

Coal Tar Products

There is very little change to report in the market for coal tar products from last week.

90% BENZOL is slightly weaker, and is quoted at 1s. 8d. to 1s. 8½d. per gallon on rails.

PURE BENZOL is steady at 1s. 11d. to 2s. per gallon on rails.

CREOSOTE OIL is firm at 5¾d. per gallon on rails in the North, and 7d. to 7¼d. per gallon in the South.

CRESYLIC ACID is quieter, and is quoted at 1s. 5d. to 1s. 6d. per gallon on rails for the pale quality 97/99%, while the dark quality 95/97% can be obtained at 1s. 1d. per gallon on rails.

SOLVENT NAPHTHA is steady at 1s. 4d. to 1s. 5d. per gallon on rails.

HEAVY NAPHTHA can be bought at 1s. 2d. per gallon.

NAPHTHALENES are very weak, the lower grades being worth from £3 to £3 10s. per ton, while the 74/76° quality is quoted at £5 per ton, and 76/78° quality at £5 10s. per ton.

PITCH remains dull, with little demand, prices are unchanged at 40s. to 42s. 6d. f.o.b. London, 37s. 6d. to 40s. f.o.b. East and West Coast ports.

Latest Oil Prices

LONDON.—LINSEED OIL steady but quiet; spot, £40 5s.; September, £39 10s.; October-December, £39 12s. 6d.; January-April, £39 10s. RAPE OIL quiet; crude, crushed, spot, £49 10s.; technical refined, £52 10s. COTTON OIL slow; refined, common edible, £49; Egyptian, crude, £43 10s.; deodorised, £51. TURPENTINE firm and 3d. to 6d. per cwt. higher; American, spot, 76s.; October-December, 77s.; and January-April, 79s. 6d.

HULL.—LINSEED OIL.—Spot and September, £40; October-December, £39 17s. 6d.; January-April, £39 15s. COTTON OIL.—Bombay crude, £39 15s.; Egyptian crude, £41 10s.; edible refined, £45 10s.; deodorised, £49; technical, £42 15s. PALM KERNEL OIL.—Crushed, naked, 5½ per cent., £42 10s. GROUNDNUT OIL.—Crushed/extracted, £48; deodorised, £52. SOYA OIL.—Extracted and crushed, £42; deodorised, £45 10s. RAPE OIL.—Extracted, £48 10s. per ton, net, cash terms, ex mill. CASTOR OIL and COD OIL unchanged.

American Market Movements

(From *Drug and Chemical Markets*)

IMPROVEMENT continues to be reported in heavy chemicals, and prices are very firm, although advances are few and slight. Sal ammoniac, chlorates, copper sulphate, and oxalic acid remain strong.

Better inquiry is increasingly evident in the fine chemical field. Most items are in firmer positions, although actual orders are not yet forthcoming to any extent, and prices show little change. Alcohol advanced and menthol declined. Other articles quiet.

Benzene market decidedly easier following gasolene reductions, although prices are firm and no weakness is forecast. Cresylic acid weak. Pyridine firm. Phenol dull. Positions of intermediates show only slight changes and market is quiet. Cotton seed oil down again. Linseed oil higher. Chinawood oil easy. Animal oils steady. Tallow unchanged. Oleo oil strong. Consuming demand slight for all oils, although the market is being closely followed.

Nitrogen Products Market

Export.—During the last week there has been considerable demand from several countries, and sales have been made on the basis of £11 15s. per ton, f.o.b. U.K. port in single bags. The market appears to be taking up all the available quantities at this figure.

Home.—The home demand continues steady with increased demand from Ireland; home prices are, of course, unchanged.

Nitrate of Soda.—The nitrate market continues firm, and nitrate sales have been made on the basis of £11 and £11 5s. per ton, c.i.f. chief European ports.

New Irish Free State Patent Laws

VALUABLE interests will be involved in the changes arising from the new patents laws which will shortly come into force in the Irish Free State. Mr. George H. Rayner, patent agent, makes clear several of the points needing careful consideration by those concerned, as on the passing of the new Act all British patents, trade marks and registered designs will automatically cease to function in Saorstat Eireann. British patents, however, granted before December 6, 1921, will be continued upon the Irish Register if a copy of the patent is lodged in Ireland and renewal fees are paid as in England. British patents applied for after December 6, 1921, and before the passing of the Act will be granted subject to a search in the Irish Register. These privileges in regard to patents will also extend to registered trade marks and designs. Should an application for a patent be made without reference to any earlier British patents, then it must be accompanied by the report of a registered patent agent based upon a search for novelty in the British records.

Weekly Prices of British Chemical Products

The prices and comments given below respecting British chemical products are based on direct information supplied by the British manufacturers concerned. Unless otherwise qualified, the figures quoted apply to fair quantities, net and naked at makers' works.

General Heavy Chemicals

Acid Acetic, 40% Tech.—£20 per ton.

Acid Boric, Commercial.—Crystal, £40 per ton, Powder, £42 per ton.

Acid Hydrochloric.—3s. 9d. to 6s. per carboy d/d, according to purity, strength and locality.

Acid Nitric, 80° Tw.—£21 10s. to £27 per ton, makers' works, according to district and quality.

Acid Sulphuric.—Average National prices f.o.r. makers' works, with slight variations up and down owing to local considerations: 140° Tw., Crude Acid, 60s. per ton. 168° Tw., Arsenical, £5 10s. per ton. 168° Tw., Non-arsenical, £6 15s. per ton.

Ammonia Alkali.—£6 15s. per ton f.o.r. Special terms for contracts.

Bleaching Powder.—Spot, £10 10s. d/d; Contract, £9 10s. d/d, 4 ton lots.

Bisulphite of Lime.—£7 10s. per ton, packages extra, returnable.

Borax, Commercial.—Crystal, £25 per ton. Powder, £26 per ton. (Packed in 2-cwt. bags, carriage paid any station in Great Britain.)

Calcium Chlorate (Solid).—£5 12s. 6d. to £5 17s. 6d. per ton d/d, carriage paid.

Copper Sulphate.—£25 to £25 10s. per ton.

Methylated Spirit 64 O.P.—Industrial, 2s. 5d. to 2s. 11d. per gall. Mineralised, 3s. 8d. to 4s. per gall., in each case according to quantity.

Nickel Sulphate.—£38 per ton d/d.

Nickel Ammonia Sulphate.—£38 per ton d/d.

Potash Caustic.—£30 to £33 per ton.

Potassium Bichromate.—5d. per lb.

Potassium Chlorate.—3¾d. per lb., ex wharf, London, in cwt. kegs.

Salammoniac.—£45 to £50 per ton d/d. Chloride of ammonia, £37 to £45 per ton. Carr. pd.

Salt Cake.—£3 15s. to £4 per ton d/d. In bulk.

Soda Caustic, Solid.—Spot lots delivered, £15 12s. 6d. to £18 per ton, according to strength; 20s. less for contracts.

Soda Crystals.—£5 to £5 5s. per ton ex railway depots or ports.

Sodium Acetate 97/98%.—£21 per ton.

Sodium Bicarbonate.—£10 10s. per ton, carr. paid.

Sodium Bichromate.—4d. per lb.

Sodium Bisulphite Powder 60/62%.—£17 per ton for home market, 1-cwt. iron drums included.

Sodium Chlorate.—3d. per lb.

Sodium Nitrate refined 96%.—£13 5s. to £13 10s. per ton, ex Liverpool.

Sodium Nitrite 100% basis.—£27 per ton d/d.

Sodium Phosphate, £14 per ton, f.o.r. London, casks free.

Sodium Sulphate (Glauber Salts).—£3 12s. 6d. per ton.

Sodium Sulphide conc. solid. 60/65.—£13 5s. per ton d/d. Contract, £13. Carr. pd.

Sodium Sulphide Crystals.—Spot, £8 12s. 6d. per ton d/d. Contract, £8 10s. Carr. pd.

Sodium Sulphite, Pea Crystals.—£14 per ton f.o.r. London, 1-cwt. kegs included.

Coal Tar Products

Acid Carbolic Crystals.—5d. per lb. Slightly better demand. Crude 60's, 1s. 3d.

Acid Cresylic 97/99.—1s. 5d. to 1s. 6d. per gall. Better demand. Pale, 95%, 1s. 3d. to 1s. 5d. per gall. Dark, 1s. 3d. to 1s. 6d. per gall.

Anthracene Paste 40%.—3d. per unit per cwt.—Nominal price. No business.

Anthracene Oil, Strained.—7½d. per gall. Unstrained, 6½d. per gall.

Benzol.—Crude 65's.—10d. to 1s. per gall., ex works in tank wagons. Standard Motor, 1s. 8d. to 1s. 9d. per gall., ex works in tank wagons. Pure, 1s. 11d. to 2s. per gall., ex works in tank wagons. Firm.

Toluol.—90%, 1s. 8d. to 1s. 9d. per gall. More inquiry. Pure, 1s. 11d. to 2s. per gall.

Xylol Commercial.—1s. 9½d. to 2s. 3d. per gall. Pure, 3s. 3d. per gall.

Creosote.—Cresylic, 20/24%, 8½d. per gall. Standard specification, middle oil, heavy, 5¾d. to 6½d. per gall. Steady demand.

Naphtha.—Solvent 90/160, 1s. 4d. to 1s. 6d. per gall. Demand good. Solvent 90/190, 1s. to 1s. 0½d. per gall. Fair demand.

Naphthalene Crude.—Drained Creosote Salts, £2 10s. to £5 per ton. Market quiet. Whizzed or hot pressed. No demand.

Naphthalene.—Crystals and Flaked, £10 to £11 per ton, according to districts. Very quiet.

Pitch.—Medium soft, 35s. to 42s. 6d. per ton, according to district. Market flat.

Pyridine.—90/160, 19s. 6d. to 20s. per gall. Heavy, 11s. to 11s. 6d. per gall. Fair business.

Intermediates and Dyes

In the following list of Intermediates delivered prices include packages except where otherwise stated.

Acetic Anhydride 95%.—1s. 7d. per lb.

Acid Anthranilic 7s. per lb. 100%.

Acid Benzoic 1s. 9d. per lb.

Acid H.—3s. 6d. per lb. 100% basis d/d.

Acid Naphthionic.—2s. 2d. per lb. 100% basis d/d.

Acid Neville and Winther.—4s. 10d. per lb. 100% basis d/d.

Acid Sulphanilic.—9d. per lb. 100% basis d/d.

Aluminium Chloride, anhydrous.—10d. per lb. d/d.

Aniline Oil.—7d. to 7½d. per lb. naked at works.

Aniline Salts.—7d. to 8d. per lb. naked at works.

Antimony Pentachloride.—1s. per lb. d/d.

Benzaldehyde.—2s. 1½d. per lb. Good home inquiry.

Benzidine Base.—3s. 6d. per lb. 100% basis d/d.

Benzyl Chloride 95%.—1s. 1d. per lb.

p-Chlorphenol.—4s. 3d. per lb. d/d.

p-Chloraniline.—3s. per lb. 100% basis.

o-Cresol 29/31° C.—3d. per lb. Demand quiet.

m-Cresol 98/100%.—2s. 1d. per lb. Demand moderate.

p-Cresol 32/34° C.—2s. 1d. per lb. Demand moderate.

Dichloraniline.—2s. 3d. per lb.

Dichloraniline S. Acid.—2s. 3d. per lb. 100% basis.

Diethylaniline.—4s. 3d. per lb. d/d., packages extra, returnable.

Dimethylaniline.—2s. 1d. per lb. d/d. Drums extra.

Dinitrobenzene.—9d. per lb. naked at works.

Dinitrochlorbenzene.—£84 10s. per ton d/d.

Dinitrotoluene.—48/50° C. 8d. to 9d. per lb. naked at works. 66/68° C. 1s. per lb. naked at works.

Diphenylaniline.—2s. 10d. per lb. d/d.

G. Salt.—2s. 2d. per lb. 100% basis d/d.

a-Naphthol.—1s. 10d. per lb. d/d. Fair home inquiry.

B-Naphthol.—1s. per lb. d/d. Fair home inquiry.

a-Naphthylamine.—1s. 3d. per lb. d/d. Fair home inquiry.

B-Naphthylamine.—3s. 9d. per lb. d/d.

m-Nitraniline.—3s. 9d. per lb. d/d.

p-Nitraniline.—1s. 11d. per lb. d/d.

Nitrobenzene.—5d. to 5½d. per lb. naked at works. Good home inquiry.

o-Nitrochlorbenzol.—2s. 3d. per lb. 100% basis d/d.

Nitronaphthalene.—10d. per lb. d/d.

p-Nitrophenol.—1s. 9d. per lb. 100% basis d/d.

p-Nitro-*o*-amido-phenol.—4s. 6d. per lb. 100% basis.

m-Phenylene Diamine.—4s. per lb. d/d.

p-Phenylene Diamine.—9s. 9d. per lb. 100% basis d/d.

R. Salt.—2s. 4d. per lb. 100% basis d/d.

Sodium Naphthionate.—2s. 2d. per lb. 100% basis d/d.

o-Toluidine.—8d. per lb.

p-Toluidine.—2s. 3d. per lb. naked at works.

m-Toluylene Diamine.—4s. per lb. d/d.

Wood Distillation Products

Acetate of Lime.—Brown £9 10s. to £10. Quiet market. Grey, £15 per ton. Liquor, 9d. per gall. 32° Tw.

Acetone.—£73 per ton.

Charcoal.—£7 5s. to £8 10s. per ton, according to grade and locality.

Iron Liquor.—1s. 7d. per gall. 32° Tw. 1s. 2d. per gall, 24° Tw.

Red Liquor.—10d. to 1s. per gall. 14/15° Tw.

Wood Creosote.—2s. 9d. per gall. Unrefined.

Wood Naphtha, Miscible.—4s. 3d. per gall. 60% O.P. Solvent, 4s. 6d. per gall. 40% O.P.

Wood Tar.—£4 per ton.

Brown Sugar of Lead.—£43 per ton.

Rubber Chemicals

Antimony Sulphide.—Golden, 7¼d. to 1s. 5d. per lb., according to quality, Crimson, 1s. 5d. to 1s. 7½d. per lb., according to quality.

Arsenic Sulphide, Yellow.—2s. per lb.

Barytes.—£3 10s. to £6 15s. per ton, according to quality.

Cadmium Sulphide.—4s. 4d. per lb.

Carbon Bisulphide.—£25 to £28 per ton, according to quantity.

Carbon Black.—5½d. per lb., ex wharf.

Carbon Tetrachloride.—£55 to £60 per ton, according to quantity, drums extra.

Chromium Oxide, Green.—1s. 3d. per lb.

Diphenylguanidine, 4s. to 4s. 3d. per lb.

Indiarubber Substitutes, White and Dark.—5¾d. to 6¾d. per lb.

Lamp Black.—£43 per ton, barrels free.

Lead Hyposulphite.—9d. per lb.

Lithopone, 30%.—£22 10s. per ton.

Mineral Rubber "Rubpron."—£13 12s. 6d. per ton f.o.r. London.

Sulphur.—£9 to £11 per ton, according to quality.

Sulphur Chloride.—4d. per lb., carboys extra.
Sulphur Precip. B.P.—£50 to £55 per ton.
Thiocarbamide.—2s. 6d. to 2s. 9d. per lb.
Thiocarbanilide.—2s. 1d. to 2s. 3d. per lb.
Vermilion, Pale or Deep.—5s. per lb.
Zinc Sulphide.—1s. 1d. per lb.

Pharmaceutical and Photographic Chemicals

Acid, Acetic, 80 % B.P.—£39 per ton ex wharf London in glass containers.
Acid, Acetyl Salicylic.—2s. 6d. to 3s. per lb. Keen competition continuing. Good demand.
Acid, Benzoic B.P.—2s. to 2s. 3d. per lb., according to quantity.
Acid, Boric B.P.—Crystal £46 per ton, Powder £50 per ton. Carriage paid any station in Great Britain.
Acid, Camphoric.—19s. to 21s. per lb.
Acid, Citric.—1s. 2½d. to 1s. 3d. per lb., less 5%. Weak.
Acid, Gallic.—2s. 9d. per lb. for pure crystal, in cwt. lots.
Acid, Pyrogallic, Crystals.—5s. 4d. to 5s. 6d. per lb.
Acid, Salicylic.—1s. 5½d. to 1s. 6d. per lb. Technical.—10½d. to 11d. per lb.
Acid, Tannic B.P.—2s. 8d. per lb.
Acid, Tartaric.—11d. to 11½d. per lb.
Amidol.—9s. per lb., d/d.
Acetanilide.—1s. 5d. per lb. for quantities.
Amidopyrin.—13s. 3d. per lb.
Ammonium Benzoate.—3s. 3d. to 3s. 6d. per lb., according to quantity.
Ammonium Carbonate B.P.—£37 per ton. Powder, £39 per ton in 5 cwt. casks.
Atropine Sulphate.—11s. 6d. per oz. for English make.
Barbitone.—10s. 3d. to 10s. 6d. per lb. Lower owing to increased supplies.
Benzonaphthol.—3s. 6d. per lb. spot.
Bismuth Carbonate.—12s. 9d. to 14s. 9d. per lb.
Bismuth Citrate.—11s. 4d. to 13s. 4d. per lb.
Bismuth Salicylate.—10s. 2d. to 12s. 2d. per lb.
Bismuth Subnitrate.—10s. 9d. to 12s. 9d. per lb.
} Prices advanced. Supplies of the metal much easier. according to quantity.
Borax B.P.—Crystal £29, Powder £30 per ton. Carriage paid any station in Great Britain.
Bromides.—Potassium, 1s. 11d. to 2s. per lb.; sodium, 2s. 1d. to 2s. 2d. per lb.; ammonium, 2s. 5d. to 2s. 6d. per lb., all spot. British or Imported. Firm.
Calcium Lactate.—1s. 3d. to 1s. 9d., according to quantity.
Chloral Hydrate.—3s. 5d. to 3s. 6d. per lb., duty paid.
Chloroform.—2s. 5½d. to 2s. 7½d. per lb., according to quantity.
Creosote Carbonate.—6s. 9d. per lb.
Formaldehyde.—£40 per ton, in barrels ex wharf.
Glycerophosphates.—Fair business passing. Calcium, soluble and citrate free, 7s. per lb.; iron, 8s. 9d. per lb.; magnesium, 9s. per lb.; potassium, 50%, 3s. 6d. per lb.; sodium, 60%, 2s. 6d. per lb.
Guaiacol Carbonate.—6s. 2d. to 6s. 6d. per lb.
Hexamine.—2s. 2d. powder crystal, 2s. 6d. free running crystal, per lb.
Homatropine Hydrobromide.—30s. per oz.
Hydrastine Hydrochloride.—English make offered at 120s. per oz.
Hydrogen Peroxide (12 vols.).—1s. 8d. per gallon f.o.r. makers' works, naked.
Hydroquinone.—4s. 4¾d. per lb., in cwt. lots.
Hypophosphites.—Calcium, 3s. 6d. per lb., for 28 lb. lots; potassium, 4s. 1d. per lb.; sodium, 4s. per lb.
Iron Ammonium Citrate B.P.—1s. 8d. to 1s. 11d. per lb. Green, 2s. 2d. to 2s. 7d. per lb. U.S.P., 1s. 7d. to 1s. 10d. per lb.
Magnesium Carbonate.—Light Commercial, £34 per ton net. Light pure, £46 per ton.
Magnesium Oxide.—Light Commercial, £70 per ton, less 2½%, price reduced; Heavy Commercial, reduced to £24 per ton, less 2½%; Heavy Pure, 2s. to 2s. 3d. per lb., according to quantity.
Menthol.—A.B.R. recrystallised B.P., 42s. 6d. net per lb., October delivery. Synthetic, 22s. 6d. to 27s. 6d. per lb., according to quality. English make.
Mercurials.—Red oxide, 5s. 2d. to 5s. 4d. per lb.; Corrosive sublimate, 3s. 7d. to 3s. 9d. per lb; white precipitate, 4s. 6d. to 4s. 8d. per lb.; Calomel, 3s. 10d. to 4s. per lb. Still quiet.
Methyl Salicylate.—1s. 8d. per lb.
Methyl Sulphonal.—16s. 9d. to 17s. per lb. Demand limited.
Metol.—11s. per lb. British make.
Paraformaldehyde.—2s. for B.P. quality.
Paraldehyde.—1s. 4d. per lb., in free bottles and cases.
Phenacetin.—4s. to 4s. 3d. per lb.
Phenazone.—6s. to 6s. 3d. per lb. Spot lower than forward price.
Phenolphthalein.—4s. to 4s. 3d. per lb. Supply exceeds demand.
Potassium Bitartrate 99/100% (Cream of Tartar).—78s. per cwt., less 2½% for ton lots.
Potassium Citrate.—1s. 7d. to 1s. 10d. per lb.
Potassium Ferricyanide.—1s. 9d. per lb. Quiet.
Potassium Iodide.—16s. 8d. to 17s. 5d. per lb., according to quantity. Steady market.
Potassium Metabisulphite.—7½d. per lb., 1-cwt. kegs included, f.o.r. London.
Potassium Permanganate.—B.P. crystals, 7¾d. per lb., spot. Firmer.
Quinine Sulphate.—2s. 3d. to 2s. 4d. per oz., in 100 oz. tins. Steady market.
Resorcin.—3s. 10½d. per lb. In fair quantities.
Saccharin.—63s. per lb. in 50 lb. lots.
Salol.—3s. 3d. to 3s. 6d. per lb.
Silver Proteinate.—12s. per lb. for satisfactory product light in colour.
Sodium Benzoate, B.P.—1s. 10d. to 2s. 2d. per lb.
Sodium Citrate, B.P.C., 1911.—1s. 4d. to 1s. 7d. per lb., B.P.C., 1923. 1s. 7d. to 1s. 8d. per lb., according to quantity. U.S.P., 1s. 7d. to 1s. 10d. per lb.
Sodium Hyposulphite, Photographic.—£14 to £15 per ton, according to quantity, d/d consignee's station in 1-cwt. kegs.
Sodium Metabisulphite Crystals.—37s. 6d. to 60s. per cwt., net cash, according to quantity.
Sodium Nitroprusside.—16s. per lb.
Sodium Potassium Tartrate (Rochelle Salt).—80s. per cwt., for ton lots and upwards.
Sodium Salicylate.—Powder, 1s. 10d. to 2s. 3d. per lb. Crystal 1s. 11½d. to 2s. 2d. per lb. Flake, 2s. 1d. to 2s. 4d. per lb. Prices cut fine: keen competition.
Sodium Sulphide, pure recrystallised.—10d. to 1s. 2d. per lb.
Sodium Sulphite, anhydrous, £27 10s. to £28 10s. per ton, according to quantity; 1-cwt. kegs included.
Sulphonal.—12s. 3d. to 12s. 6d. per lb. Limited demand.
Thymol.—11s. to 15s. per lb.

Perfumery Chemicals

Acetophenone.—9s. per lb.
Aubepine (ex Anethol).—10s. per lb.
Amyl Acetate.—3s. per lb.
Amyl Butyrate.—6s. 6d. per lb.
Amyl Salicylate.—3s. 1½d. per lb.
Anethol (M.P. 21/22° C.).—5s. per lb.
Benzyl Acetate from Chlorine-free Benzyl Alcohol.—2s. 4d. per lb.
Benzyl Alcohol free from Chlorine.—2s. 4d. per lb.
Benzaldehyde free from Chlorine.—2s. 9d. per lb.
Benzyl Benzoate.—2s. 9d. per lb.
Cinnamic Aldehyde Natural —15s. 6d. per lb.
Coumarin.—13s. per lb.
Citronellol.—19s. per lb.
Citral.—9s. per lb.
Ethyl Cinnamate.—9s. per lb.
Ethyl Phthalate.—3s. per lb.
Eugenol.—9s. 6d. per lb.
Geraniol (Palmarosa).—27s. per lb.
Geraniol.—8s. to 16s. per lb.
Heliotropine.—6s. 3d. per lb.
Iso Eugenol.—14s. 6d. per lb.
Linalol ex Bois de Rose.—19s. 6d. per lb.
Linalyl Acetate.—18s. 6d. per lb.
Methyl Anthranilate.—9s. 3d. per lb.
Methyl Benzoate.—5s. per lb.
Musk Ketone.—30s. per lb.
Musk Xylol.—7s. 9d. per lb.
Nerolin.—4s. per lb.
Phenyl Ethyl Acetate.—14s. per lb.
Phenyl Ethyl Alcohol.—12s. per lb.
Rhodinol.—36s. 6d. per lb.
Safrol.—1s. 8d. per lb.
Terpineol.—1s. 8d. per lb.
Vanillin.—23s. 3d. per lb.

Essential Oils

Almond Oil.—12s. 6d. per lb.
Anise Oil.—3s. 6d. per lb.
Bergamot Oil.—22s. per lb.
Bourbon Geranium Oil.—16s. per lb.
Camphor Oil.—60s. per cwt.
Cananga Oil, Java.—11s. 3d. per lb.
Cinnamon Oil, Leaf.—5d. per oz.
Cassia Oil, 80/85%.—9s. 3d. per lb.
Citronella Oil.—Java, 85/90%, 3s. 7d.; Ceylon, 2s. 3d. per lb.
Clove Oil.—7s. 6d. per lb.
Eucalyptus Oil, 70/75%.—1s. 10d. per lb.
Lavender Oil.—French 38/40% Esters, 26s. per lb.
Lemon Oil.—6s. per lb.
Lemongrass Oil.—4s. 6d. per lb.
Orange Oil, Sweet.—10s. 9d. per lb.
Otto of Rose Oil.—Bulgarian, 60s. per oz. Anatolian, 35s. per oz.
Palma Rosa Oil.—13s. 9d. per lb.
Palma Rose Oil.—15s. 3d. per lb.
Peppermint Oil.—Wayne County. No good quality material available. Japanese, 26s. per lb. Much firmer.
Petitgrain Oil.—9d. per lb.
Sandal Wood Oil.—Mysore, 26s. per lb. Australian, 18s. 6d. per lb.

Scottish Chemical Market

The following notes on the Scottish Chemical Market are specially supplied to* THE CHEMICAL AGE *by Messrs. Charles Tennant and Co., Ltd., Glasgow, and may be accepted as representing the firm's independent and impartial opinions.

Glasgow, September 11, 1925.

BUSINESS in heavy chemicals remains fairly active although quantities called for are not large.

Prices both for home products and foreign show little change.

Industrial Chemicals

ACID ACETIC.—In moderate request and price unchanged; 98/100% glacial, £56 to £67 per ton, according to quality and packing, c.i.f. U.K. ports. 80% pure, £40 to £42 per ton; 80% technical, £39 to £41 per ton, packed in casks, c.i.f. U.K. ports.

ACID BORIC.—Crystal, granulated or small flaked, £40 per ton; powdered, £42 per ton, packed in bags, carriage paid U.K. stations.

ACID CARBOLIC, ICE CRYSTALS.—In moderate demand and price unchanged at about 5¼d. per lb., delivered, or f.o.b. U.K. ports.

ACID CITRIC, B.P. CRYSTALS.—Quoted 1s. 4d. per lb., less 5%, ex store. Offered for prompt shipment at 1s. 3⅞d. per lb., less 5%, ex wharf.

ACID FORMIC, 85%.—Spot material quoted, £48 10s. per ton, ex store. On offer from the continent at about £47 per ton, c.i.f. U.K. ports.

ACID HYDROCHLORIC.—In little demand. Price, 6s. 6d. per carboy, ex works.

ACID NITRIC, 80°.—Quoted £23 5s., ex station, full truck loads.

ACID OXALIC, 98/100%.—Unchanged at about 3½d. per lb., ex store. Offered for prompt shipment from the continent at about 3⅜d. per lb., ex wharf.

ACID SULPHURIC.—144°, £3 12s. 6d. per ton; 168°, £7 per ton, ex works, full truck loads. Dearsenicated quality, 20s. per ton more.

ACID TARTARIC, B.P. CRYSTALS.—Quoted 11½d. per lb., less 5%, ex store. Offered for forward delivery at 11¼d. per lb., less 5%, ex wharf.

ALUMINA SULPHATE, 17/18% IRON FREE.—Quoted £6 15s. per ton, ex store, spot delivery. Offered for prompt shipment from the continent at £6 5s. per ton, c.i.f. U.K. ports.

ALUM, LUMP POTASH.—Spot material unchanged at £9 5s. per ton, ex store. Offered for early shipment from the continent at about £8 per ton, c.i.f. U.K. ports.

AMMONIA ANHYDROUS.—Moderate demand and price unchanged at 1s. 4½d. per lb., less 5%, ex station. Containers extra and returnable.

AMMONIA CARBONATE.—Lump, £37 per ton; powdered, £39 per ton. Packed in 5 cwt. casks, delivered U.K. ports.

AMMONIA LIQUID, 880°.—In steady demand. Unchanged at 2½d. to 3d. per lb., delivered according to quantity.

AMMONIA MURIATE.—Grey galvanisers' crystals quoted £28 per ton, ex station. Offered from the continent at about £24 per ton, c.i.f. U.K. ports. Fine white crystals quoted £19 10s. per ton, c.i.f. U.K. ports.

ARSENIC, REFINED WHITE CORNISH.—A further reduction in price is recorded. Spot lots now quoted £24 10s. per ton, ex store. Offered for early delivery at about £23 10s. per ton, ex wharf.

BARIUM CHLORIDE.—Large crystals quoted £9 10s. per ton, ex store. On offer at £8 5s. per ton, c.i.f. U.K. ports to come forward. Fine white crystals quoted about £7 5s. per ton, c.i.f. U.K. ports.

BLEACHING POWDER.—Spot lots English material, £10 10s. per ton, ex station. Contracts 20s. per ton less. On offer from the continent at about £8 7s. 6d. per ton, c.i.f. U.K. ports.

BARYTES.—English material unchanged at £5 5s. per ton, ex works. Continental quoted £5 per ton, c.i.f. U.K. ports.

BORAX.—Granulated, £24 10s. per ton; crystals, £25 per ton; powdered, £26 per ton. Carriage paid U.K. stations, minimum ton lots.

CALCIUM CHLORIDE.—English manufacturers' prices unchanged at £5 12s. 6d. to £5 17s. 6d. per ton, carriage paid U.K. stations. Continental on offer at £4 2s. 6d. per ton, c.i.f. U.K. ports.

COPPERAS, GREEN.—In good demand for export. Quoted £3 12s. 6d. per ton, f.o.b. U.K. ports, packed in casks.

COPPER SULPHATE.—Spot material available at about £23 10s. per ton, ex wharf. English for export quoted £24 10s. per ton f.o.b. U.K. ports.

FORMALDEHYDE 40%.—Rather better inquiry. Spot material now quoted £40 per ton, ex store. Offered for prompt shipment at about £39 5s. per ton c.i.f. U.K. ports.

GLAUBER SALTS.—English material unchanged at £4 per ton, ex store or station. Continental quoted £2 17s. 6d. per ton c.i.f. U.K. ports.

LEAD, RED.—Quoted £43 per ton c.i.f. U.K. ports. Early delivery. Spot material available at about £44 per ton, ex store.

LEAD, WHITE.—Now quoted £44 10s. per ton, ex store. Spot delivery.

LEAD ACETATE.—White crystals spot material now quoted £45 per ton, ex store. Brown about £43 per ton, ex store. White crystals on offer from the continent at £43 15s. per ton c.i.f. U.K. ports. Brown about £38 10s. per ton c.i.f. U.K. ports.

MAGNESITE, GROUND CALCINED.—Now quoted £8 15s. per ton, ex station.

POTASH CAUSTIC, 88/92%.—Quoted £27 10s. per ton c.i.f. U.K. ports. Limited quantities of spot material available at about £30 per ton, ex store.

POTASSIUM BICHROMATE.—Price for home consumption, 5d. per lb. delivered.

POTASSIUM CARBONATE.—Rather scarce for immediate delivery. Spot material now quoted £27 per ton, ex store. Limited quantities available for early shipment at about £26 per ton c.i.f. U.K. ports.

POTASSIUM CHLORATE, 99/100%.—Quoted £32 per ton c.i.f. U.K. ports. Offered for October delivery at slightly less.

POTASSIUM NITRATE, SALTPETRE, 99%.—Refined granulated quoted at about £24 10s. per ton c.i.f. U.K. ports. Spot material quoted £27 per ton, ex store.

POTASSIUM PERMANGANATE, B.P. CRYSTALS.—Spot material quoted 8d. per lb., ex store. Offered for early delivery at 7¾d. per lb., ex wharf.

POTASSIUM PRUSSIATE, YELLOW.—Offered for prompt shipment from the continent at 7½d. per lb., ex wharf. Spot lots quoted 7¾d. per lb., ex store, in moderate demand.

SODA CAUSTIC.—76/77%, £18 per ton; 70/72%, £16 12s. 6d. per ton; broken 60%, £17 2s. 6d. per ton; powdered, 98/99%, £21 7s. 6d. per ton. All carriage paid U.K. stations, spot delivery. Contracts 20s. per ton less.

SODIUM ACETATE.—Quoted £18 15s. per ton, ex store, spot delivery. On offer from the continent at about £17 15s. per ton c.i.f. U.K. ports.

SODIUM BICARBONATE.—Refined recrystallised quality, £10 10s. per ton, ex quay or station. M.W. quality, 30s. per ton less.

SODIUM CARBONATE, SODA CRYSTALS.—£5 to £5 5s. per ton, ex quay or station. Powdered or pea quality, £1 7s. 6d. per ton more. Alkali 58%, £8 12s. 3d. per ton, ex quay or station.

SODIUM HYPOSULPHITE.—English material unchanged at £9 10s. per ton, ex station, minimum four ton lots. Pea crystals, £14 per ton, ex station. Continental quoted £9 10s. per ton, ex store.

SODIUM NITRATE.—Quoted £13 per ton, ex store. 96/98% refined quality, 7s. 6d. per ton extra.

SODIUM NITRITE 100%.—Quoted £24 per ton, ex store. Offered from the continent about £22 5s. per ton c.i.f. U.K. ports.

SODIUM PRUSSIATE, YELLOW.—In good demand and price advanced to about 4½d. per lb., ex store. Offered for forward delivery at a fraction less.

SODIUM SULPHATE, SALTCAKE.—Price for home consumption, £3 10s. per ton f.o.r. works. Good inquiry for export and higher prices obtainable.

SODIUM SULPHIDE.—English material. Solid 60/62%, now £13 per ton. Broken, £14 per ton. Flake, £15 per ton. Crystals, £8 10s. per ton. Carriage paid U.K. stations, minimum four ton lots with slight reductions for contracts to the end of the year. 60/62% solid offered from the continent at £10 15s. per ton c.i.f. U.K. ports. Broken, £1 per ton more. 30/32% crystals, £7 15s. per ton c.i.f. U.K. ports.

SULPHUR.—Flowers, £10 10s.; roll, £9 10s.; rock, £9 7s. 6d.; ground, £9 10s., per ton, ex store, spot delivery. Prices nominal.

ZINC CHLORIDE, 98/100%.—Quoted from the continent at £24 5s. per ton c.i.f. U.K. ports. 97/98% of English manufacture on offer at £25 per ton f.o.b. U.K. ports.

ZINC SULPHATE.—Fine white crystals quoted £12 10s. per ton c.i.f. U.K. ports.

NOTE.—The above prices are for bulk business and are not to be taken as applicable to small parcels.

Coal Tar Intermediates and Wood Distillation Products

BENZIDINE BASE.—3s. 6d. per lb. Small home inquiries.

DIPHENYLAMINE.—3s. per lb. Some home inquiries.

H. ACID.—3s. 6d. per lb. Some home inquiries.

DIMETHYLANILINE.—2s. 1d. per lb. Fair home inquiries.

Manchester Chemical Market

[From Our Own Correspondent.]

Manchester, September 11, 1925.

Little change can be reported in the state of the chemical market here and the demand is still on a small scale. As far as the home section of the trade is concerned some improvement may be looked for if the talked-of autumn spurt in the iron and steel trades comes about, and as the holiday season in the cotton centres is coming to an end bigger buying in that direction is also a possibility. There have been some recent shipments to the continent, but most of the export business is with Canada, Australia and the East.

Heavy Chemicals

Bleaching powder is still quoted at £9 10s. per ton but buying interest is about at the same level. Hyposulphite of soda is steady and in moderate request, with photographic crystals quoted at £14 10s. to £15 and commercial quality at £9 per ton. Bicarbonate of soda is quiet but unchanged from last report at round £10 10s. per ton. Glauber salts are inactive and values have a weak tendency, current prices being round £3 10s. per ton. Saltcake is in much the same position at £3 12s. 6d. per ton. Soda crystals meet with a fair demand and £5 5s. per ton is still being asked. A quietly steady business in caustic soda is still being done, and values are firm at from £15 12s. 6d. per ton for 60 per cent. to £18 for 76-77 per cent. Sulphide of sodium is a slow seller at about £12 per ton for 60-65 per cent. concentrated solid and £9 5s. for commercial quality. Phosphate of soda is quiet and easy at £12 to £12 10s. per ton. Alkali meets with a quietly steady demand and values are held at about £6 15s. per ton. Acetate of soda is on offer at £18 per ton, but little buying interest is being shown. Chlorate of soda is firm and in moderate request at 3d. per lb. Prussiate of soda is well maintained at its recent level of 4d. per lb.

Caustic potash is still only moderately active at £28 10s. to £29 per ton. Carbonate of potash has met with a fair demand and price is maintained at about £25 10s. per ton for 96-98 per cent. Bichromate of potash is rather quiet, but values are unchanged from last week at round 5d. per lb. Permanganate of potash is in fair request and prices are fairly steady; pharmaceutical is on offer at 7¾d. to 8d. per lb., and commercial quality at round 6d. Chlorate of potash is firm though not too active at 4d. per lb.

Arsenic continues to be a dull and weak section of the market, with white powdered, Cornish makes, offering at about £19 per ton at works, and at £22 to £23 per ton in Manchester. Sulphate of copper is selling only in relatively small quantities, but quotations still range between £24 and £24 10s. per ton. Nitrate of lead is firm and in moderate enquiry at about £42 per ton. Acetate of lead is steady although only in limited request at £45 per ton for white and about £41 for brown material. Acetate of lime is quiet and easy at £14 5s. per ton for grey and £7 15s. for brown. Epsom salts are in small demand at round £3 15s. per ton for commercial; magnesium sulphate, B.P. quality, is easier at £5 5s. per ton.

Acids and Coal Tar Products

Tartaric acid is on offer at 11¾d. per lb., with business rather restricted. Citric acid is also quiet, though prices are about unchanged at 1s. 3½d. to 1s. 4d. per lb. Oxalic acid is dull at about 3¾d. per lb. Acetic acid meets with a fair demand and quotations are maintained, 80 per cent. commercial at £38 per ton and glacial at about £67.

Among coal-tar products pitch is more or less nominal at 40s. per ton and demand is quiet. Creosote oil is in moderate request and values are steady at 5¾d. to 6d. per gallon. Naphthalene is dull and easy at round £13 5s. per ton for refined material and from £4 5s. for crude. Solvent naphtha is in limited request with prices fairly steady at 1s. 6d. per gallon. Carbolic acid is dull at 4¾d. per lb. for crystal and crude nominal at about 1s. 4d. per gallon.

Hull's Oil Industries

Last week a party of Dominion representatives inspected the industrial activities of Hull. The tour to the British Oil and Cake Mills illustrated to the party how transport costs from ship to industrial works are kept low, and the labour-saving methods in use in the seed-crushing mills and in the New Pin and Britolic Soap Works, and the British Compound Lard and Bakit Lard Buildings were particularly interesting. Not only are the seed oils pressed out, but now they are dissolved out by petrol distillation, yielding a much higher percentage of the oil content, according to the *Times*. The residue becomes cattle cake.

The manufacture of a vegetable lard eliminating the hog and substituting the products of vegetable seeds has opened another growing industry in Hull, and it is interesting to discover that the whole of this development of the oil seed content for soap and other purposes has, to some extent, grown out of Hull's earlier history as a whaling port.

Although Hull, of course, is not the only port dealing with seed oils, the British Oil and Cake Mills have no fewer than eighteen factories in the town, and claim to be the largest oil seed crushing firm in the world. A brief visit to the exchange in Lowgate introduced the party to the big shipping, coal, grain, and seed centre, and an inspection of the commercial museum was chiefly dictated by a desire that the Dominions should send to it specimens of their main products for reference, and to suggest by inspection new avenues of import business. A short tour of the extensive works of Reckitt and Sons closed a most interesting visit.

High Priced British Dyes

Reviewing the state of commerce during the past six months at a meeting of Blackburn Chamber of Commerce on Wednesday, Mr. George Hindle said that while the cost of dyes had been reduced they were still paying 33 per cent. more for indigo and double the price which their competitors paid for a great many dyes, thus causing them to lose not only the dyeing of the cloth but the making of it. The world was taking an increased proportion of its cloth in a dyed state, and they were not getting their share of that increase, largely through the Dyestuffs Act.

Dealing with the reply of the chairman of the Bradford Dyers' Association to the statement that the charges for bleaching, finishing, and dyeing were excessive, Mr. Hindle said: "His first statement was that the proportion of dyed cloth which was sold in 1924 was as great in proportion to that of undyed cloth as it was pre-war, and so we were not losing ground, but he omitted to refer to the statement made here and elsewhere, that other countries have increased their proportion of dyed to undyed cloths, in particular that Belgium had increased her proportion from 41 per cent. pre-war to 79 per cent. in 1923. One might also remark that Japan had increased her exports to India of dyed cloth in a much greater proportion than we had.

"The second statement made by the chairman of the Bradford Dyers' Association was that their return in 1924 was 9·9 per cent. on the capital employed, and that eminent financial authorities considered that this was not unreasonable. Their profit last year was £944,141. They had a balance carried forward of £659,645. They had investments and loans of £2,624,194. Their £1 shares are quoted at 84s. 6d. These enormous profits were made from dyeing cloth, the spinners and weavers of which had not made any profit at all."

Distilled Water Production

Distilled water production is necessary in many branches of the chemical industry, particularly in battery production, and a recent booklet "Patent Automatic Stills" issued by Brown and Son (Alembic Works), Ltd., of 9, Wedmore Street, London, N.19, will be read with interest. The stills illustrated and described are of patent automatic design, built of hard rolled copper heavily pure-tin coated. Their solid construction offers long service without sacrificing compactness. A special feature is that in-coming water is pre-heated before entering the boiler by use as cooling water to the condenser. The makers claim that it will produce chemically pure water at a cost of 1¼d. per gallon when gas heated, and ¼d. per gallon when steam heated. Paraffin oil heated stills and fire-box stills are also illustrated and the firm manufactures complete laboratory equipment.

Company News

BOOTS PURE DRUG CO.—A dividend is announced at the rate of 36 per cent. per annum, less tax.

INTERNATIONAL NICKEL CO.—A quarterly distribution of $0.50 on the common stock has been declared, payable on September 30 to holders of record at September 11.

BRITISH OIL AND CAKE MILLS.—The directors announce an interim dividend on the cumulative preferred ordinary share capital of 5 per cent., less tax, for the current year.

IDRIS HYDRAULIC TIN.—An interim dividend of 1s. per share (less tax at 4s. 1½d. in the £), is announced payable on September 28. This is the second interim payment in respect of 1925. The total dividend for 1924 was 12½ per cent.

LAUTARO NITRATE CO., LTD.—A meeting of the company will be held at Winchester House, London, on November 9 to consider the articles of association respecting the remuneration of the board of directors in London and the local board in Chile.

AMALGAMATED ZINC (DE BAVAYS').—The profits for the half year ended December 31 were £21,746 and the surplus brought forward was raised to £21,816, which was carried to new account. Since the close of the half year a dividend of 1s. per share has been paid.

POWELL DUFFRYN STEAM COAL CO., LTD.—Having carefully considered the accounts for the half year ended June 30 last, the directors have resolved to pay on September 22 the usual dividend on the preference shares and the second preference shares. In view of the extremely difficult conditions now prevailing in the coal industry, the question of a dividend on the ordinary shares is deferred until the result of the whole year's working is known.

NOBEL INDUSTRIES, LTD.—For the year 1924 the profit was £1,003,420, after allowing for income tax deducted from dividends by the constituent and associated companies, and after making provision for ascertained losses in respect of certain specific investments and for some revision of the sterling cost values of certain foreign investments in consequence of the sterling exchange now being brought back to parity by the gold standard. After providing £72,733 debenture interest (less tax) paid and accrued to December 31, 1924, and after writing off one-thirtieth of the cost of debenture issue (£2,977), the balance at credit of profit and loss is £927,709 which, with the amount carried forward from the previous year, viz., £650,130, amounts to £1,577,840. Dividends, making a total of 9 per cent., have been paid on the ordinary shares, the balance now available being £716,597. The directors recommend that £50,000 be allocated to "special investment reserve account," thereby increasing this reserve to £550,000, and leaving £666,597 to be carried forward.

CALICO PRINTERS' ASSOCIATION, LTD.—The annual report of the directors covering the period to June 30, 1925, states that the profits for the year, after providing £503,249 for maintenance, depreciation, repairs, renewals and up-keep, and £128,000 for debenture interest, amount to £532,597. Adding to this the profit of £167,708 on the sale of the French works, together with the accumulated balances against loss on exchange released by this transaction, and £218,615 brought forward, there is a total available balance of £918,920. The payment of a dividend at the rate of 5 per cent. per annum on the preference shares for the year June 30, 1925, is proposed, against which the directors have declared and distributed an interim dividend on March 31, 1925, for the half-year ended December 31, 1924. The directors recommend a dividend on the ordinary shares for the year at the rate of 10 per cent. per annum, and a bonus of 5 per cent. out of the surplus on the French transaction, placing to the reserve account £150,000 and to the employes' benefit fund £100,000, leaving a balance to be carried forward of £216,504. The annual meeting will be held in Manchester, on September 16, at 11 a.m.

Indian Steel Bounty

THE Government resolution to pay a bounty to the Tata Steel Co. for 18 months ending March, 1927, subject to a limit of 60 lakhs of rupees, was carried by the Council on Wednesday.

New Chemical Trade Marks

Applications for Registration

This list has been specially compiled for us by Mr. H. T. P. Gee, Patent and Trade Mark Agent, Staple House, 51 and 52, Chancery Lane, London, W.C.2, from whom further information may be obtained, and to whom we have arranged to refer any inquiries relating to Patents, Trade Marks and Designs.

Opposition to the Registration of the following Trade Marks can be lodged up to October 9, 1925.

"UNIFIX"

449,925. For a glue. Tom Lett, Wansey Street Works, Wansey Street, Walworth, London, S.E.17. manufacturer. July 7, 1924. (To be Associated. Sect. 24.)

"UNIPLY"

449,926. For a glue. Tom Lett, Wansey Street Works. Wansey Street, Walworth, London, S.E.17, manufacturer. July 7, 1924. (To be Associated. Sect. 24.)

"UNIMET"

449,927. For a glue. Tom Lett, Wansey Street Works, Wansey Street, Walworth, London, S.E.17, manufacturer. July 7, 1924. (To be Associated. Sect. 24.)

"VITROID"

456,609. For chemical substances used in manufactures, photography, or philosophical research and anti-corrosives. Class 1. Frederick William Atack, Corner of River and Orchard Streets, Kingston, Ontario, Canada, chemical manufacturer. February 25, 1925. (To be associated. Sect. 24.)

"ZYKLON"

457,332. For chemical substances used in manufactures, photography, or philosophical research and anti-corrosives, Class 1. Deutsche Gesellschaft fur Schadlingsbekampfung mit Beschankter Haftung (a joint stock company organised under the laws of Germany), Steinweg 9, Frankfurt-am-Main, Germany, manufacturers. March 18, 1925. (To be Associated. Sect. 24.)

"GRAINETTE"

459,795. For paints. Class 1. Hoyle, Robson, Barnett and Co., Ltd., St. Nicholas Chambers, Amen Corner, Newcastle-on-Tyne, paint, colour and varnish manufacturers. June 17. 1925. (Concurrent user claimed. Sect. 21.)

"STACKFOR"

459,802. For chemical substances used in manufactures, photography, or philosophical research and anti-corrosives. Class 1. Société Anonyme de Produits Adhesifs (a Joint Stock Company organised under the laws of Switzerland), 3, Place du Molard, Geneve, Switzerland, manufacturers. June 17, 1925.

"ZYKLON"

457,333. For chemical substances used for agricultural, horticultural, veterinary and sanitary purposes. Class 2, Deutsche Gesellschaft fur Schadlingsbekampfung mit Beschankter Haftung (a joint stock company organised under the laws of Germany), Steinweg 9, Frankfurt-am-Main, Germany, manufacturers. March 18, 1925. (To be Associated. Sect. 24.)

Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

HAND FIRE EXTINGUISHERS.—The Monopoly Administration at Belgrade desire to receive tenders for the supply of 223 hand fire extinguishers before September 23. British firms desirous of offering British-made extinguishers as specified can obtain further particulars. (Reference No. B.X. 2014.)

INDUSTRIAL AND PHARMACEUTICAL CHEMICALS.—A firm of agents in Melbourne desire to represent British manufacturers of industrial and pharmaceutical chemicals. (Reference No. 294.)

ABRASIVE MATERIALS AND FIRE EXTINGUISHERS.—An agent in Amsterdam wishes to obtain sole representation of British manufacturers of the above. (Reference No. 284.)

Tariff Changes

CUBA.—The following alterations are enforced: Common salt (crude, ground, or manufactured); olive oil and edible cotton oil (other than bottled), and vinegar are now all exempt from mport surtax. "Gasolina" is now defined as the product obtained by the distillation of crude petroleum from the initial point of distillation up to 150 degrees. The import duty is reduced to 1/10 of a centavo per gallon, and a consumption duty of 10 centavos per gallon is established on all petrol consumed in Cuba.

FRENCH EQUATORIAL AFRICA (GABOON).—The following are revised duties (all per 100 kilogs): Schist oils, petroleum and other mineral oils, 8 francs; lime, 3 fr.; sodium chloride, 3 fr.; soap, 0·1 fr. Chemical products of all kinds, 10 per cent. *ad valorem*.

GERMANY.—Hardened whale oil of recognised purity is now duty free. Phosphorus (common and red), alcoholic varnishes, shellac cement are now deleted from the Tariff Bill. Amendments include (all in reichmarks per 100 kilogs): Phosphate of lime (even if artificial), free; citric acid, 20; acetates not elsewhere mentioned in the tariff, 1; arsenious acid, arsenic acid and arsenic compounds, not elsewhere mentioned or included in the tariff, 6; sodium phosphate (Dinatriumphosphat), 2; Biphosphate of soda (Natriumbiphosphat) and other phosphorus salts not elsewhere mentioned, 10; carbonate of baryta, artificial, 1·50; chloride of calcium, 1; Magnesium chloride, free; radioactive preparations, not elsewhere mentioned or included, 15,000; salicylic acid, salicylates not elsewhere mentioned or included, 75; wood spirit, crude; acetone, crude, 2.

"Monomarks"

BOOKLETS have been received from British Monomarks, Ltd., of 19, Abingdon Street, London, S.W.1, which has been floated to exploit the new system of identification and commercial marking known as "Monomarks." The principle of the system has already been referred to in THE CHEMICAL AGE. Briefly, it consists in giving manufacturers and traders a definite and unduplicated mark—for instance BM/RT3T—by which their goods may be identified, and by which any outside party quoting this monomark may get into communication with the maker or merchant, via Monomark House. At the central organisation, the letters or other packages will be re-directed to the registered owner of the monomark quoted.

It is interesting to note that the board includes Lord Meston, Chairman Associated Portland Cement Manufacturers; Lord Glenconner, Director Tharsis Copper and Sulphur Co., Ltd.,; and Mr. H. Donald Hope, Director Nobel Industries, Ltd.

Chemical Trade in Persia

A REPORT has been published by the Department of Overseas Trade on trade and industry in Persia to-day. The mineral oil industry is important, and the total export value of Persia's oil was 163,124,000 krons, and the main producers, the Anglo-Persian Oil Co., also figure largely in the trade in petrol, kerosene, oil and similar products, the home sales of which during a recent period of nine months were valued at 14,870,000 krons. Mineral oils are responsible for about half the total exports of the country.

Great Britain is the most important trading country, with 57 per cent. of the total trade. Soviet Russia's share is 18 per cent. Before the war Russia claimed 60 per cent. to our 21 per cent. The Russian trade, however, is particularly active and is making progress in North Persia. About a quarter of the total imports of sugar, valued at £627,000, were taken from Great Britain. During 1923-24 Germany's trade with Persia increased in value by over 100 per cent., though still less than pre-war figures. Sugar and synthetic dyes (the supply of which to the carpet industry is once more practically a German monopoly) are the chief items.

Mining resources are as yet not adequately exploited, but red oxide has been mined on the island of Hormuz in the Persian Gulf and is in good demand both in Britain and America.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

County Court Judgment

[*NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.*]

BOOTH, Mr. T. A., Tee-A-Bee Works, Idle, wholesale dealer. (C.C., 12/9/25.) £21 2s. 2d., August 7; and £10 6s., August 11.

Mortgages and Charges

[*NOTE.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.*]

BAIRD AND TATLOCK (LONDON), LTD., London, E.C., laboratory furnishers. (M., 12/9/25.) Registered August 25, £20,000 debentures created July 28, 1903 (inclusive of £12,500 already registered) (filed under sec. 93 (3) of the Companies (Consolidation) Act, 1908), present issue £5,400; general charge. *£3,300. August 7, 1925.

BRITISH PURE OIL, GREASE AND CARBIDE CO., LTD., Bristol. (M., 12/9/25.) Registered August 31, £8,000 first debenture, to Miss E. M. Crabbe, 11, Rokeby Avenue, Redland, Bristol; general charge.

CANDLE KING, LTD., Cardiff, soap and candle manufacturers. (M., 12/9/25.) Registered August 31, £5,000 debentures; general charge (subject to and additional to mortgage dated May 3, 1923). *£2,800 bank overdraft. December 22, 1924.

GRAYS DYES AND COLOURS, LTD., Leeds. (M., 12/9/25.) Registered September 1, £5,000 second debenture and bonus of 2 per cent., to A. Hirst, Broomfield, Longwood, Huddersfield, woollen manufacturer; general charge. *£10,000. August 8, 1925.

JACKSON (CLAUD), LTD., London, W.C., manufacturers of toilet compounds, etc. (M., 12/9/25.) Registered August 2, £4,000 debentures (filed under sec. 93 (3) of the Companies (Consolidation) Act, 1908), present issue £2,100; general charge. *Nil. November 4, 1924.

New Companies Registered

DORR CO., LTD., 16, South Street, London. To act as consulting, manufacturing, operating and managing, mining, metallurgical, industrial and chemical engineers, to design, invent, adapt, develop and use processes and machinery for the treatment and reduction of ores and other substances in mining, etc. Nominal capital, £5,000 in £1 shares.

MILLBROOK PAINTS, LTD., Millbrook Paint Works, Neath Road, Landore, Swansea. Exporters and importers of and dealers and traders in aniline, alizarine, mineral and other colours, wholesale druggists, dyers and cleaners, leather dyers and wood stainers, etc. Nominal capital, £2,000 in £1 shares.

A. AND M. REID, LTD., 26, Commercial Street, Leith. Druggists, chemists, drysalters, oil and colourmen, etc. Nominal capital, £5,000 in £1 shares.

SMITH, TAYLOR, SONS AND CO., LTD., 1, Dickinson Street, Manchester. Dealers in coal, minerals, stones, chemicals, chemical compounds and explosives of all kinds, plant, machinery, etc. Nominal capital, £300 in £1 shares.